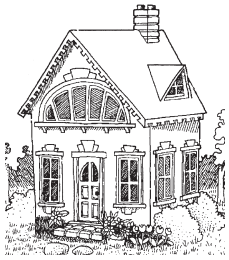
ROCKY MOUNTAIN INSTITUTE

Home Energy Brief



#5 COOKING APPLIANCES & DISHWASHERS

Cooking food and washing dishes costs the average American household $125 a year, and accounts for about 10% of all energy used in the home. Fortunately, there are many simple ways to operate your cooking appliances and dishwasher more efficiently, which can save you money and reduce pollution. And if you're in the market for new appliances, by choosing wisely among the latest models you can increase your kitchen's energy efficiency still further.

COOKING APPLIANCES

Because of all the heat they generate, cooking appliances are among the biggest energy consumers in the home. If you live in a hot climate, cooking can also drive up energy costs indirectly by forcing your air-conditioning to work harder.

Cooking habits, not technology, represent the biggest potential for energy savings in the kitchen. Tests by the U.S. Bureau of Standards have shown that some people use 50% more energy than others to cook the same meal.

More efficient appliances can help trim energy bills, too, although with the exception of the microwave, new cooking technologies aren't resulting in breakthrough energy savings. Unlike most other appliances, ranges, ovens, and stove-tops aren't subject to government minimum-efficiency standards, and manufacturers tend to concentrate more on styling and ease of cleaning than energy efficiency.

Cooking with Gas: Pros and Cons

About 58% of American households cook with electricity, but **gas cooking** is making a steady comeback.

Gas has several advantages, starting with **efficiency**. Gas stove-tops and ovens use much less energy than their electric counterparts because the fuel is used directly for cooking; to power an electric appliance, the fuel must be converted into electricity at a power plant and then transmitted over long distances, typically requiring three or four units of fuel to produce one unit of electricity. A gas appliance costs less than half as much to operate as an electric one, provided it's equipped with **electric ignition** instead of a pilot light. **Pilot lights** burn only small amounts of gas, but they burn it 24 hours a day, 365 days a year, and in the average household this waste is roughly equal to the amount of gas actually used for cooking. (It's not hard to shut off pilot lights, but for safety reasons we do not recommend this.) Most modern ovens and ranges have electric ignition, and proposed federal energy standards would require this feature in all models.

In addition, gas burners tend to be more responsive and easier to control than electric ones, and do a better job of heating pans with rounded bottoms.

The downside of cooking with gas is that it carries additional hazards, notably the combustibility of the gas itself and the health risk of the **fumes** produced by combustion. Gas appliances require ventilation to the *outside* (recirculating the air through a filter isn't adequate), and this is all the more essential

TYPICAL ANNUAL ENERGY COST OF COOKING APPLIANCES

	Gas (w/ pilot)	*Gas (w/electric ignition)*	*Electric*
Stove-top	$24	$11	$23
Oven	$22	$13	$27
Self-cleaning oven	N/A	$14	$29

Adapted from Residential Appliances Atlas *(1994), E* SOURCE, *Boulder, CO. Figures are based on national average energy prices of 8.3¢/kWh of electricity and $6.15/million Btu of gas.*

if your house is well-sealed for energy efficiency. Unfortunately, the warm air evacuated by a range hood fan or downdraft ventilator is replaced by cold outside air, which places additional demand on your heating system and poses the risk of backdrafting from the furnace and fireplace. Some fans on the market use make-up air ducts to offset this; otherwise, make sure your fan isn't too powerful for its purpose.

Stove-Tops

For most of us, a stove-top is either an **electric coil element** or a **gas burner**. In recent years, however, a number of new styles have been introduced:

Solid discs are heated by electrical resistance just like coil elements—the only difference is that they're solid for easier cleaning. But with more thermal mass, they take longer to heat up and typically use more electricity.

Radiant elements are electric coil elements placed under heat-resistant ceramic glass, again for easy cleaning. They too take longer to heat up, although their energy efficiency is comparable to standard electric coil elements.

Halogen elements use a quartz-halogen lamp to radiate heat to the ceramic glass surface, while **magnetic induction elements** heat metal pans directly by exciting the molecules magnetically. Both of these stove-tops are more efficient than standard coil elements, but they are quite expensive, and induction cooktops require that you use only iron or steel pots and pans.

Whatever kind of stove-top you use, the following tips will help you reduce the amount of energy you use in preparing meals:

- Cover pots with lids to prevent heat from escaping, which can reduce energy use by up to two-thirds.
- When appropriate, use a pressure cooker. By cooking food at a higher temperature and pressure, cooking time is reduced dramatically and energy use is cut by 50–75%.
- Minimize heating requirements by using the smallest pan necessary. If you cook with gas, don't turn the flame on really high unless you're using a large pot.
- When boiling, use as little water as needed to do the job.
- On electric stove-tops, use only flat-bottomed pans that make full contact with the element. A warped or rounded pan will waste most of the heat.
- Keep metal grease plates under burners clean, or line them with aluminum foil, to reflect heat more effectively up to the cookware.

ENERGY COSTS OF VARIOUS COOKING METHODS

Ever wonder whether you should use the oven or the microwave? Below is an estimate of the cost of different options for cooking a typical casserole:

Electric oven	16¢
Convection oven (electric)	11¢
Toaster oven	8¢
Gas oven	7¢
Frying pan	7¢
Crock pot	6¢
Microwave oven	3¢

Adapted from Consumer Guide to Home Energy Savings *(1995), American Council for an Energy-Efficient Economy, Washington, DC. Assumes 8¢ per kWh for electricity and 60¢ per therm for natural gas.*

Ovens

Conventional **ovens** or ranges are inherently inefficient, because in order to heat up the food they must first heat up about 35 pounds of steel and a large amount of air: tests indicate that only about 6% of the energy output of a typical oven is actually absorbed by the food. When it comes to the oven, your best bet for saving energy is to use it only when cooking large dishes or batches, and to opt instead for a smaller appliance (such as a toaster oven or microwave) whenever possible.

Of electric ovens, **convection ovens** are the most efficient. By using a fan to circulate the hot air around the food, convection ovens allow a decrease in temperatures and cooking times. The convection function saves the most energy when the oven is filled with several dishes, which would otherwise hamper heat distribution; savings may be less when the oven is underfilled.

Ovens with a **self-cleaning** function are up to 20% more energy-efficient because they have more insulation to withstand the higher temperatures sustained during the cleaning cycle. That said, if you use the self-cleaning function more than once a month,

you'll use more energy than the insulation saves.

Ovens and ranges also can contribute to overheating of your home in summer, increasing air-conditioning bills or making the home unpleasantly hot. If you have air-conditioning, remember that the less energy wasted in heating food, the less work your air-conditioner will have to do to keep your home cool.

Here are some more tips for making optimum use of your oven:

- Cook several dishes at the same time in the oven, or cook larger portions and reheat for another meal. Reheating takes less energy than cooking, and you'll have fewer dishes to wash.
- Bake with ceramic or glass pans, which will allow you to lower the oven temperature by about 25°F.
- Use thermometers or timers to avoid overcooking.
- Don't cover oven racks with foil—this reduces heat flow and increases cooking time.
- Turn the oven off a few minutes before your food is ready; the oven will remain hot enough to finish cooking the food.
- If you have a self-cleaning oven, plan to clean it right after you've finished baking something so it doesn't have to start from cold.

Microwaves

Microwave ovens use up to two-thirds less electricity than conventional electric ovens, and are particularly effective for reheating meals. Microwaves heat food directly by exciting water and fat molecules in the food, which means they don't waste energy heating air and metal, and they don't generate surplus heat to task your air-conditioner. In addition, newer models feature "smart" controls that sense when food is done and turn the oven off to avoid overcooking.

Microwaves aren't suitable for cooking certain types of foods, such as pastry, although more expensive models combine the capabilities of a microwave with the features of a conventional oven (electric elements for browning, fans for convection). Such an all-in-one oven won't necessarily save energy, but it might eliminate the need for a conventional one.

Tips for efficient microwaving:

- Keep inside surfaces clean so the microwave radiation can reach food effectively.
- Plan ahead—defrosting food in a microwave may be convenient, but defrosting it at room temperature is free.
- Zapping pre-packaged microwavable meals often uses more energy than cooking from scratch, if you count the energy used in processing, precooking, packaging, and transportation.

Other Cooking Appliances

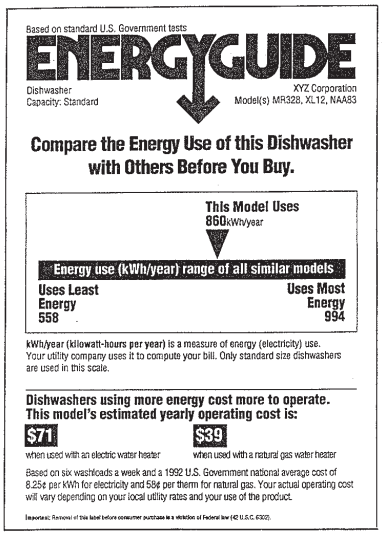
Toaster ovens use a third to a half the power of conventional electric ovens, and **crock pots** are very efficient for cooking soups and stews (see table). When cooking small portions, these humble appliances are appropriate technology.

More popular in Europe than in the U.S., **electric kettles** use about one-third less energy than a regular kettle heated on a stove-top.

DISHWASHERS

A **dishwasher** typically uses the equivalent of 700–850 kWh of electricity annually, or nearly as much energy as a clothes dryer or freezer. The majority of this energy is used not to run the machine but to heat the water for washing dishes—which means that the best way to improve dishwashing efficiency is to cut down on hot-water consumption.

Most modern dishwashers have a built-in **booster heater**, which raises the temperature of the water during wash cycles to 140°F to kill germs and cut grease. While this feature adds somewhat to the dishwasher's electricity demand, it enables you to lower the setting on your hot-water heater to 120°F (the


Based on standard U.S. Government tests

ENERGYGUIDE

Dishwasher
Capacity: Standard

XYZ Corporation
Model(s) MR328, XL12, NAA83

Compare the Energy Use of this Dishwasher with Others Before You Buy.

This Model Uses
860kWh/year

Energy use (kWh/year) range of all similar models

Uses Least Energy
558

Uses Most Energy
994

kWh/year (kilowatt-hours per year) is a measure of energy (electricity) use. Your utility company uses it to compute your bill. Only standard size dishwashers are used in this scale.

Dishwashers using more energy cost more to operate. This model's estimated yearly operating cost is:

$71 when used with an electric water heater

$39 when used with a natural gas water heater

Based on six washloads a week and a 1992 U.S. Government national average cost of 8.25¢ per kWh for electricity and 58¢ per therm for natural gas. Your actual operating cost will vary depending on your local utility rates and your use of the product.

Important: Removal of this label before consumer purchase is a violation of Federal law (42 U.S.C. 6302).

Energy Guide Labels, required on all new dishwashers (but not on cooking appliances), provide useful information about annual energy costs and relative efficiency.

highest temperature needed for all other household uses). Each 10°F reduction in your water heater's setting will save up to 13% on your *total* water heating bill, and also reduce the danger of scalding. But beware, many dishwasher booster heaters are not thermostatically controlled—they turn on regardless of the intake water temperature, which merely adds to the energy waste if you don't turn down your water heater. (For further tips on improving your water heater's efficiency, see the "Water Heating" brief in this series.)

The most **water-efficient dishwashers** currently on the market use about 5 gallons of hot water per load, or less than half as much as the least efficient ones. Remember that a dishwasher that uses half as much water will only need half as much energy to heat that water. You can also reduce your machine's water energy use manually by using **"light wash"** or **"energy saving" cycles** when appropriate.

Another energy-saving option—mandatory on all new models—is a switch that allows you to choose between heat-drying and **air-drying**. Heat-drying elements draw considerable electricity; circulation fans for air-drying use relatively little.

Sizing of appliances is a critical factor in achieving energy efficiency. In dishwashers, there are compact and standard-capacity units. **Compact models** use less energy per load, but hold fewer dishes so you may actually consume more energy operating them more frequently.

Tips:

- Avoid rinsing dishes before you load them in the dishwasher, or if you must rinse, use cold water. Modern dishwashers are built to cut through most food residue, and rinsing only duplicates this effort.
- Always operate a dishwasher with a full load. If this isn't possible, use an energy-saving cycle.
- Select the no-heat-drying option, if your machine has it. If not, stop the machine before the drying cycle begins and open the door to let dishes air-dry.

Hand-Washing

Hand-washing dishes can use a lot less hot water than a dishwasher, if done efficiently. It also, obviously, eliminates the cost of the dishwasher itself and the electricity to run it.

Here are some tips for efficient hand-washing:

- Wash dishes by the load, not one at a time.
- If you have two sinks, fill one with hot soapy wash water and the other with cold rinse water. Leaving the water running when washing or rinsing will cost you about 4¢ a minute.
- A 2.5-gallon-per-minute faucet aerator will save as much as half the water used by standard faucets, and it's easy to install. An aerator with a fingertip on-off valve makes it easy to shut the flow to a trickle between uses.

RESOURCES

American Council for an Energy-Efficient Economy, 2140 Shattuck Avenue, Suite 202, Berkeley, CA 94704 (510/549-9914). Publishes *Consumer Guide to Home Energy Savings*, which lists brands and models of appliances and their annual energy use and cost.

Energy Efficiency and Renewable Energy Clearinghouse, PO Box 3048, Merrifield, VA 22116 (800/523-2929). Has free information on efficient appliances.

Florida Solar Energy Center, 300 State Road 401, Cape Canaveral, FL 32920-4099 (407/783-0300). Researches appliance efficiency.

Massachusetts Audubon Society, Education Resources Office, 208 South Great Road, Lincoln, MA 01773 (617/259-9506). Publishes an appliances booklet.

New Consumer Institute, PO Box 51, Wauconda, IL 60084. Publishes *The Conscious Consumer*.

Contact your local utility or energy office for information on rebates that may be available in your area on the purchase of new energy-efficient appliances.

For more on kitchen appliances and related home-energy measures, see Rocky Mountain Institute's forthcoming *Homemade Money: How to Save Energy and Dollars in Your Home*. Other titles in this series of Home Energy Briefs include *Lighting; Windows*; *Water Heating*; *Refrigerators and Freezers*; *Washers, Dryers, and Miscellaneous Appliances*; and *Computers and Peripherals*. Written by Maureen Cureton and Dave Reed.

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