Energy Facts: Conserving Energy in Home Hot Water Use
Michigan State University
Cooperative Extension Service

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ENERGY FACTS

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Conserving Energy In Home Hot Water Heating

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Heating water is the second largest energy user in your home, next to space heating. It takes about 15 percent of the energy consumed in an average home. The actual amount of energy used to heat water in your home depends on: the number of persons in your household, their water use habits, and the efficiency of the water heater. New, more efficient models are coming on the market. Chart 1 gives the amount of fuel consumed according to the amount of hot water used per week and the efficiency of the water heater. The amount of fuel used for a year has been calculated in kwh (kilowatt-hours) of electricity, CCF (hundred cubic feet) of natural gas, and gallons of propane.

Chart 1. Hot water fuel use

Type of water heater	Efficiency of heater	Fuel Consumed Per Year According to Gallons of Hot Water Used[1]		
		Low Use (300 gal/wk)	Average Use (450 gal/wk)	High Use (700 gal/wk)
Electric average efficiency model[2]	79%	4330 kWh/yr.	6490 kWh/yr.	8650 kWh/yr.
Electric most-efficient model[3]	97%	3500 kWh/yr.	5250 kWh/yr.	7000 kWh/yr.
Natural Gas average efficiency model[2]	48%	243 CCF/yr.	364 CCF/yr.	485 CCF/yr.
Natural Gas most-efficient model[3]	58%	200 CCF/yr.	300 CCF/yr.	400 CCF/yr.
Propane Gas average efficiency model[2]	48%	264 gal/yr.	396 gal/yr.	528 gal/yr.
Propane Gas most-efficient model[3]	58%	217 gal/yr.	326 gal/yr.	435 gal/yr.

[1] *Assume 90°F temperature rise in hot water, e.g., 45°F to 135°F and 8.3 lbs./gallon.*
Energy purchased in BTU's = $\frac{\text{Temperature rise x gal. of hot water x 8.3}}{\text{efficiency of the water heater system}}$
1 kWh = 3,412 BTU
1 CCF = 100,000 BTU
1 gal. propane = 92,000 BTU

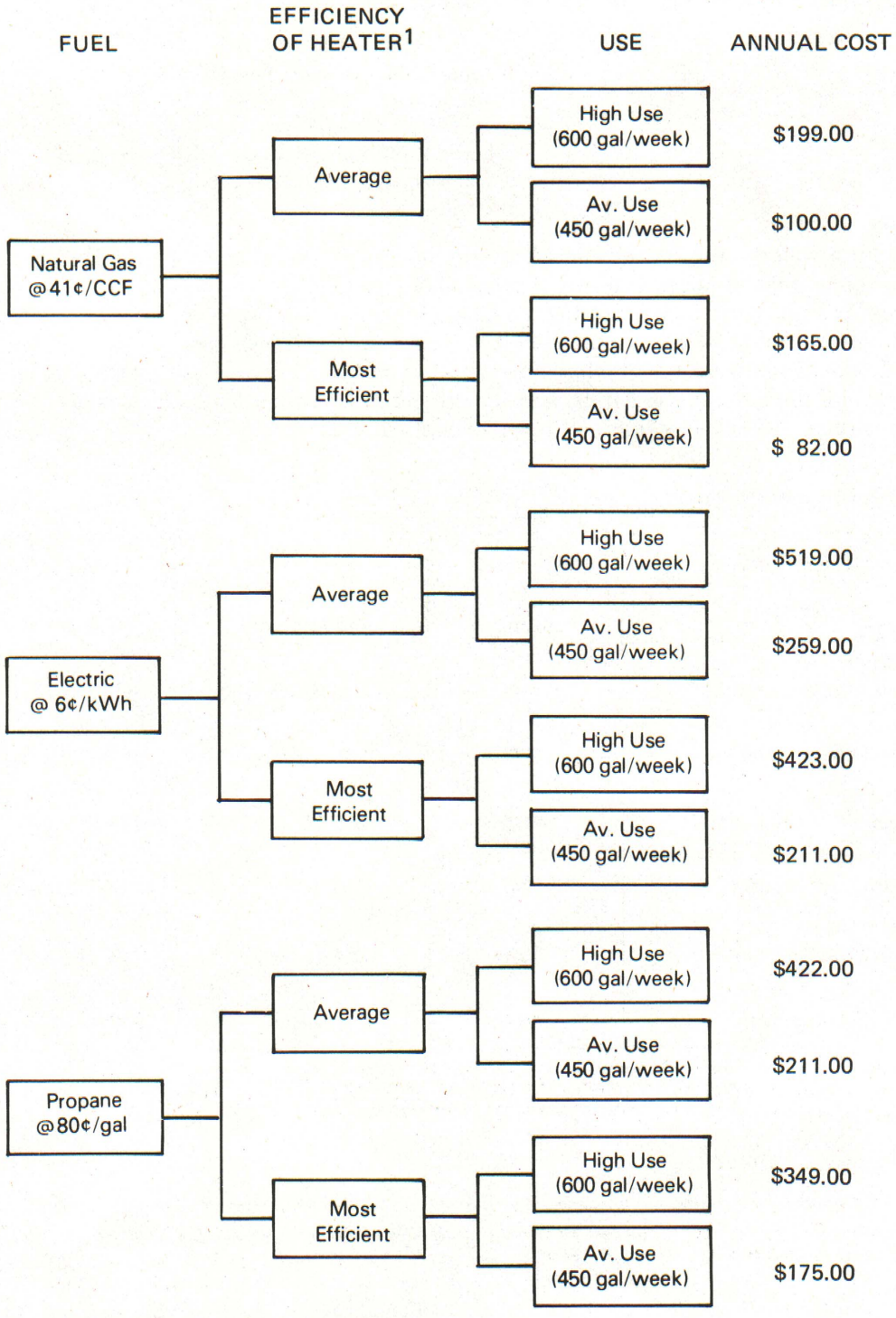
[2] *"Average" models have the average efficiency of all models sold in 1978. Source: Federal Register, June 30, 1980.*

[3] *"Most-efficient" models have the highest efficiency of all models available in January 1980. Heater efficiency and fuel usage were derived from data in the Federal Register, March 25, 1980.*

[1] Charts and part of text adapted from "Hot Water and Your Energy Budget," by Roger A. Peterson and Wanda W. Olson, Extension Specialists, University of Minnesota.

Chart 2 compares costs due to hot water usage and efficiencies of new water heaters. Estimated annual costs are based on Spring 1981 fuel prices in mid-Michigan.

Chart 2. Example results of annual hot water cost for water heated from 45°F to 135°F



[1] *Efficiencies as described in footnote 2 and 3, Chart 1.*

REDUCING AMOUNT OF WATER USED

The amount of hot water used can be reduced by eliminating uses, using the minimum amount for each purpose, using lower temperature water, and reusing heated water whenever possible. Let's look at ways you can cut your own water use.

For Laundering

Changing from hot water wash and warm rinse to warm wash and cold rinse can save about half the energy used in laundering. Hot water wash may be needed to clean items with heavy or greasy soils, and cold water can always be used for rinsing. Suds savers let you recycle hot water for a second load. Doing only full loads, or adjusting water levels to size of load, cuts hot water waste. (For more information, see MSU Cooperative Extension Bulletin E-1121, Energy Fact Sheet, Saving Energy and Doing The Laundry Free). You can save enough energy to run a 16-cubic foot freezer for a year by adjusting wash and rinse temperatures.

For Washing Dishes

Hot water is necessary to clean and sanitize dishes. A dishwasher uses 13-16 gallons, all hot, for a normal cycle. By running it only when full, and by avoiding extra cycles, you use hot water most efficiently and save energy and money. You can get by with a little less hot water if you wash dishes by hand once a day and wash and rinse in dishpans or stoppered sink basins. But if you rinse under a running faucet, you can use twice as much hot water as in the dishwasher. Stop before you reach for the hot water faucet to rinse dishes before washing. Develop the habit of scraping them, and using cold water if prerinsing is needed.

For Bathing

Depending on your personal habits, you may use 12 to 25 gallons of water for a bath. Or, you may use only 3 or 4 gallons for a frugal shower — one in which you turn off the water as you soap and scrub. But if you tend to take extended showers, you may use more than 25 gallons of water. An easy way to check whether your showers use more or less water than tub baths is to put the stopper in the tub the next time you shower.

Water for bathing, handwashing, shampooing, is a mixture of hot and cold — usually more than half hot. If you turn down the thermostat setting on your water heater so the water is not as hot, then more of that hot water will be mixed with cold water in bathing to achieve the same comfortable "warm" temperature. A shower head, with a flow restrictor, saves energy and water. A 10-minute shower using a flowrate of 3 to 6 gallons per minute will use from 30 to 60 gallons of warm water. A low-flow (flow restrictor) shower head allows about 2 gallons per minute, or 20 gallons of warm water.

You can save water by not turning on faucets farther than needed. Some faucets have flow resistors in them that reduce water flow. Flow-control valves can be installed in water supply lines to reduce flow through faucets. Such valves or flow restrictors can be purchased at plumbing supply stores.

Changing habits can save much hot water. Try running less water in the tub for a bath. For a shower, turn on the faucet for only two brief periods, first to wet the body and again to rinse off after soaping. Question if a daily shower or bath is necessary for everyone; sometimes substitute a spongebath from the lavatory.

All of these suggestions together can add up to a significant change in the cost of heating water, as shown in Chart 3.

Chart 3. Annual estimated savings with changes in water use habits[1]

Habit change per week	Annual Savings		
	Gal. Hot Water	kWh	CCF
Eliminate one bath or 6-10 min. shower[2]	1040	232	13.4
Shorten one 6-10 min. shower to 1-1½ min.[2]	884	197	11.4
Use flow restrictor for one 6-10 min. shower[2]	520	116	5.7
Eliminate one dishwasher load[3]	780	174	10.1
Eliminate one laundry load in hot water[4]	936	209	12.1
Change one laundry load from hot to warm wash[5]	468	105	6.0

[1] Assume cold water at 45°F, hot water at 135°F, and water heating system efficiencies of 97 percent for electric and 58 percent for gas.

[2] One-half fill bath (2½ x 5 tub) or 6-10 min. shower - 30 gallons @ 105°F. 1-1½ min. shower - 4½ gallons @ 105°F.; a flow restrictor can reduce the water flow up to 50 percent.

[3] 14 gallons

[4] 18 gallons fill of hot water, cold water used in rinse.

[5] Warm settings usually use 50 percent hot and 50 percent cold water.

THE HOT WATER HEATER

Temperature Setting

It takes more energy to heat water to a higher temperature; it also takes additional energy to maintain water at that temperature as it stands in the heater between uses. Lowering the temperature setting saves energy, but if you have a dishwasher it should not be set lower than 140°F. for good cleaning of dishes unless your dishwasher has a booster heater. Also, it should not be set lower than 130°F. for hot wash of laundry with greasy soil. Lowering the temperature setting means more gallons of hot water will be drawn for such mixed uses as baths and showers. This could result in shortages of hot water during periods of heavy use, or if your electric water heater heats only at off-peak hours.

Insulating Pipes

When hot water is wanted at a faucet, cold water in the pipes must be drawn before hot water comes. Then, when the water is shut off the hot water in the pipe cools off so that heat is lost. This loss can be reduced by: (1) locating the water heater close to where the heaviest use occurs (this reduces the length of pipes): and (2) insulating the hot water pipes by wrapping with insulation.

Heater Insulation

Studies have shown 20 to 30 percent of the heat added to water by the heater is lost through the walls. If the outer wall of your heater feels warm to the touch, it is losing heat. Adding insulation to the outside can cut up to half this loss. Batt insulation can be fastened around the sides and top of electric water heaters. Only specially-designed insulation jackets should be used on gas water heaters and the installation instructions must be followed very carefully. One caution when adding insulation to an existing oil- or gas-fired water heater is to have a good pressure-relief valve. A pilot light continues to heat water, so if no hot water is drawn for a long period of time, the water may be overheated.

Heater Maintenance

Once a month, draw off water from the spigot at the bottom of the heater tank until the water runs clear. Sediment on the water heater will prevent it from operating efficiently. When you leave home for more than a day, turn down the temperature setting. Or if leaving for more than two or three days, turn off the heater. It will take about 2 hours to heat back up again when you turn it on, so don't plan to take baths or wash clothes immediately upon returning from a trip.

Off-Peak Heating

Electric water heaters don't actually use less electricity in off-peak hours, but it's cheaper for the utility company to produce in those hours (usually at night) so some utilities offer lower rates during that time of day. If yours does this, schedule large uses of hot water like laundering during the evening, or turn on the dishwasher before going to bed.

NEW EFFICIENT HEATERS

New water heaters have a yellow Energyguide label attached which indicates the estimated annual operating cost. It also gives the lowest and highest operating costs of similar models with the same capacity and using the same fuel so you can see if a specific model is more or less efficient than others like it. These estimated operating costs are based on laboratory tests designed to approximate typical usage (450 gallons of water per week and temperature rise of 90°F). Reducing the size of the water heater storage tank, or eliminating it altogether, reduces the heat loss through the tank wall. Electric point-of-use water heaters are available with ½ gallon tanks and can be used if small amounts of heated water are needed at one time. Gas tankless water heaters are available; the hot water output varies with the BTU/hr. rating of the burner and the temperature rise. There are no water heater temperature settings; the temperature of the water delivered is controlled by the flow-rate.

SOLAR PRE-HEATING

Water heating requirements could be reduced by as much as 30 per cent with a 25 square foot solar collector. However the payback on such a collector may take 10 or 20 years. Payback time will vary with the system you are now using. (See Extension Bulletin E-1151 *Home Hot Water Heating with Solar Energy* free).

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