#3977

Washington Energy Extension Service
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CALCULATING YOUR HOT WATER COSTS

"How much money do I spend on hot water for my home?" "What's the cost of heating water with different fuels?" If you're asking yourself these questions, this energy update will help you answer them.

The size of your water heating bill depends on:

1. the amount of hot water you use,
2. the overall efficiency of your water heating system, and
3. the cost of the fuel.

To calculate hot water use precisely, you would need to measure the amount used for each task in the home. A less precise, but easier method is to estimate your use based on the averages given below. Those uses that contribute most to hot water demand are bathing, laundry and dishwashing.

A one person household uses approximately 20-35 gallons of hot water per day. A family of four uses approximately 50-80 gallons of hot water per day.

Calculating Energy Requirements (in Btu's)

Once you have determined the number of gallons of hot water you use in a week, the amount of energy required to heat that water can be calculated from the following conversion formulas. A "Btu" is a standard unit of energy and is equal to the amount of heat required to raise one pound of water by one degree Fahrenheit.

_____ x 52 weeks/year = _____
Gallons per week Gallons per year

_____ x 8.34 lbs./gallon = _____
Gallons per year Pounds per year

_____ x _____ x (1 Btu/^{o}F lb) = _____
Pounds per year Temperature Rise (Subtract 50 from your thermostat setting) Btu's per year (used)

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Calculating Operating Costs

- Electric Heaters

The overall efficiency of conventional electric water heaters depends on many factors including tank size, tank insulation levels, thermostat setting and ambient temperature. In general, efficiency will range from 70 - 90%, including standby losses. If the tank thermostat setting is low, ambient temperature high, and insulation high, then efficiency will also be high. For opposite conditions, efficiency will be lower. Basically, you can assume 75% efficiency if the tank is poorly insulated and 85% if well insulated. Cost can finally be calculated by inserting the electricity rate you are charged (yearly average).

Btu's per year (used)	÷	Efficiency (.85 well insulated .75 poorly insulated)	=	Total Btu's per year (required)
Total Btu's per year (required)	÷	3413 Btu's/kWh	=	Total kWh per year (required)
Total kWh per year	x	Cost/kWh (1987 rate is $.045/kWh for Seattle/King County)	=	Total Cost per year (electric)

- Gas Heaters

The overall efficiency of gas water heaters ranges from 40-65%, including standby losses. The average efficiency is about 55%.

Btu's per year (used)	÷	Efficiency (.60 well insulated .50 poorly insulated)	=	Total Btu's per year (required)
Total Btu's per year (required)	÷	100,000 Btu's/Therm	=	Total Therms per year
Total Therms per year	x	Cost/Therm (1987 rate is $.50/therm)	=	Total Cost per year (gas)

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Energy Librarian
Washington State Energy Office
809 Legion Way S.E., FA-11
Olympia, WA 98504-1211

TABLE I. WATER HEATING COSTS *

AVERAGE HOT WATER USE		ANNUAL COST TO HEAT WATER ($/YR)								
Family Size	Gallons Per Day	Electric Water Heater			Gas Water Heater			Water Heating Heat Pump		
	Tank Temp.	Fuel Costs			Fuel Costs			Fuel Costs		
	140°F	120°F	3¢kwh	4¢kwh	5¢kwh	50¢ Therm	60¢ Therm	70¢ Therm	3¢kwh	4¢kwh	5¢kwh
1	34		$93	$125	$156	$87	$104	$122	$47	$63	$78
1		39	83	111	139	78	93	109	42	56	70
2	45		123	165	206	116	139	162	62	83	103
2		52	110	149	185	104	125	145	55	75	93
3	60		164	220	275	154	185	216	82	110	138
3		69.5	148	199	248	139	167	194	74	100	124
4	75		205	275	344	193	231	270	103	138	172
4		87	185	249	310	174	209	243	93	125	155
5	90		246	331	412	231	277	324	123	166	206
5		104	221	297	371	208	249	291	111	149	186
6	105		287	386	481	270	324	378	144	193	241
6		121.5	258	347	433	242	291	340	129	174	217

ASSUMPTIONS:

1. Supply water temperature from city or well = 50°F
2. Average hot water use figures compiled from Oregon Dept. of Energy. Lower tank temperatures increase hot water usage but result in lower energy use.
3. Energy Factors (GAMA): Electric = .9
   Gas = .55
   WHHP =1.8 (Reflects typical Washington operating conditions)

* SOURCE: Oregon State University