

EXHIBIT III

# Energy Tips & Choices

A Guide to an  
Energy-Efficient  
Home



Hawaiian Electric Company  
Maui Electric Company  
Hawaii Electric Light Company

*Giving you the power*

[www.heco.com](http://www.heco.com)

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## Aloha,

Electricity is vital to our quality of life. It's our cleanest, safest, cheapest, and most flexible form of energy. Imagine what our lives would be like without it.

At Hawaiian Electric and its subsidiaries, our motto is "giving you the power." We are partners with you in the use of electricity. We want to help you, our customers, use electricity more efficiently to get the most value for your money.

In this booklet you will find dozens of money-saving tips—from what to look for when shopping for new appliances to how to get more out of the appliances you have. Some savings are big; some savings are small. Add them up and you'll see how much money you can save.



If you are a HECO, MECO, or HELCO customer, you can get energy-saving tips tailored to your family's energy use. Visit My Home Energy Check at [www.heco.com](http://www.heco.com)

Energy is precious. We all need to use it wisely.

Mahalo

Hawaiian Electric Company  
Maui Electric Company  
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## Hawaiian Electric Company's Top Ten Tips for Energy Conservation



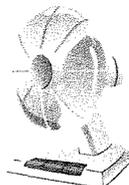
These Top Ten Tips include simple and low-cost ways that every consumer can use to conserve energy and save money.

1. **Light with compact fluorescent lights (CFLs)**

Changing just one 100-watt bulb to a CFL equivalent, based on four hours use per day, can save 108 kWh and \$16 per year.\*

2. **Use fans instead of air conditioners**

Two fans, rather than an 8,000 Btu/H (British thermal units per hour) room air conditioner running four hours a day, will save over 1,150 kWh and \$172 per year.



3. **Shorten showers**

Cutting just two minutes per shower could save up to 1,533 kWh and \$230 per year.

4. **Fix leaky faucets**

A faucet leaking just one hot water drop per second costs 400 kWh and \$60 per year.

5. **Wash clothes in cold water**

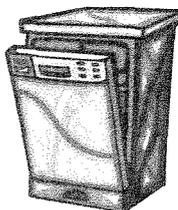
Switching from Hot Wash/Warm Rinse to the Cold/Cold cycle on a standard, top-loading washing machine for just two loads a week can save 225 kWh and \$34 per year.

6. **Eliminate energy sneakers (phantom loads)**

Use a power strip to conveniently turn off computers (after properly logging off), camera battery chargers, and cellular phone chargers, which all use standby power when not in use. Using a power strip to turn off your computer can save 50 kWh and \$8 per year.

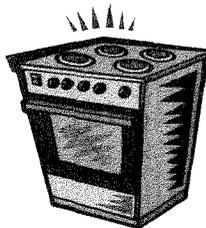
7. **Air dry dishes**

Letting dishes air dry instead of using heated drying on the average dishwasher saves 110 kWh and \$17 per year.



8. **No peeking**

Limiting how often and how long you open the refrigerator will save electricity and protect the appliance. Also limit opening the oven while cooking or baking to save electricity, protect the appliance, and speed up cooking times too.



9. **Install motion/occupancy detectors indoors and out**

Cutting use of a 150-watt, outdoor flood light from six hours to one hour per night with a motion sensor saves up to 270 kWh and \$41 per year. Switching off a 100-watt light for just one, 8-hour day per week, can save 41 kWh and over \$6 per year.

10. **Use ENERGY STAR® appliances**

When it is time to replace or add appliances, look for the ENERGY STAR symbol on refrigerators, ovens, and dishwashers, as well as DVD and VCR players, televisions, and home office equipment. Visit [www.EnergyStar.org](http://www.EnergyStar.org) to learn more.

(\*All savings based on industry averages and \$0.15 per kWh.)



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# Be Energy Smart: How much does it cost to operate your appliances?

## **Understanding Costs: Life Cycle Costs and Operating Costs**

This section explains the cost factors to consider when buying and using appliances.

## Computing the Life Cycle Cost of Appliances

When you buy a new appliance, the life cycle cost is more than just the sale price. The cost of operating the appliance should also be considered as you make your decision. When you combine the purchase price of an appliance with the energy cost of operating it over its lifetime, you get what is known as the "life cycle cost." The life cycle cost of energy-efficient appliances is typically lower than the life cycle cost of average models.

### **PURCHASE PRICE + LIFETIME ENERGY COST = LIFE CYCLE COST**

Example:

|                | Lifetime Energy Cost |   |                    |                      |   |                 |
|----------------|----------------------|---|--------------------|----------------------|---|-----------------|
|                | Purchase Price       | + | Yearly Energy Cost | x Estimated Lifetime | = | Life Cycle Cost |
| Refrigerator A | \$800                | + | (\$120             | x 20 years)          | = | \$3,200         |
| Refrigerator B | \$700                | + | (\$140             | x 20 years)          | = | \$3,500         |

Deciding to buy the more energy-efficient Refrigerator A over the lower purchase priced Refrigerator B will save you money over the refrigerator's lifetime.

## Calculating Appliance Operating Costs

### FORMULA FOR CALCULATING COST

**Cost of Operation = wattage x hours used x cost per kilowatt-hour (kWh)**

- Determine the appliance's wattage

*An appliance's wattage is usually stamped on a metal plate (nameplate) or in the plastic covering on the back or bottom of the appliance.*

- Convert wattage to kilowatts

*Since you pay for electricity in kWh, you must first convert the wattage to kilowatts. To do this, divide wattage by 1000*

$$\frac{\text{wattage}}{1000} = \text{kilowatts}$$

$$\text{(example: } \frac{1500 \text{ watts}}{1000} = 1.5 \text{ kilowatts)}$$

- **Calculate the kilowatt-hours (kWh) the appliance uses**

*Some appliances, such as refrigerators, water heaters, air conditioners, dryers, skillets, irons, and ovens, are controlled by thermostats that cycle on and off automatically, using energy only when the heating element(s) or motor(s) is on. To figure their energy use, you have to estimate the amount of time they are actually at full load.*

*Multiply the kilowatts by the number of hours the appliance operates at full load.*

$$\begin{aligned} \text{kilowatts} \times \text{hours at full load} &= \text{kWh} \\ \text{(example: } 1.5 \text{ kilowatts} \times 4 \text{ hours)} &= 6 \text{ kWh} \end{aligned}$$

- **Figure out the cost per kWh**

*You can calculate the current cost per kWh by checking your electric bill.*

*Divide the total amount charged for service (bill detail section) by the kWh usage amount (bill period section).*

$$\begin{aligned} \frac{\text{Total for Service}}{\text{kWh Usage}} &= \text{Cost per kWh} \\ \text{(example: } \frac{\$120.00}{800 \text{ kWh}} &= \$0.15 \text{ per kWh)} \end{aligned}$$

- **Calculate the cost for operating**

*Now you can figure out the cost for using your appliance for an hour.*

*Multiply the kWh for the appliance by the cost per kWh.*

$$\begin{aligned} \text{kWh} \times \text{cost per kWh} &= \text{cost for operating} \\ \text{(example: } 6 \text{ kWh} \times \$0.15/\text{kWh)} &= \$0.90 \end{aligned}$$

## THINGS TO CONSIDER

- **Horsepower**

*Motors are often rated in horsepower. One horsepower is roughly equal to one kilowatt.*

- **Amps and Volts**

*If the wattage is not listed on the appliance, but the amps and volts are listed, you can calculate the wattage. If the voltage is not provided, assume it is 120 volts, except for large appliances such as stoves, clothes dryers, and electric water heaters, which require 240 volts.*

*Multiply the amps by the volts*

$$\begin{aligned} \text{amps} \times \text{volts} &= \text{watts} \\ \text{(example: } 15 \text{ amps} \times 115 \text{ volts)} &= 1725 \text{ watts} \end{aligned}$$



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# Live Energy Lite

## **Appliance Energy Costs**

### **Where Your Electricity Goes**

#### **Buying Appliances**

This section explains energy-saving strategies for your home and gives money-saving tips for buying and using appliances that use a large to medium amount of energy, including:

Clothes Dryer

Clothes Washer

Cooling (includes Air Conditioning)

Cooking

Dishwasher

Lighting

Refrigerator/Freezer

Small Appliances

Swimming Pool

Television and Other Electronic Equipment

Water Heater

## Appliance Energy Costs

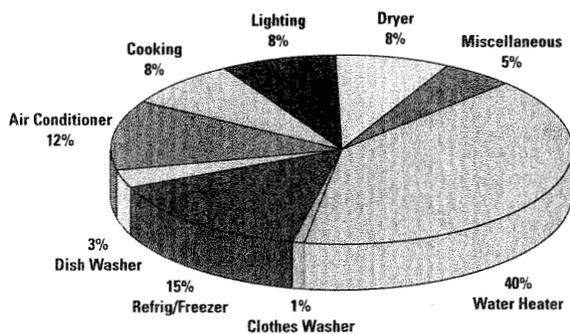
By being aware of the appliances in your home that use the most energy, you can use them sparingly to help control your energy costs.

Here are some general guidelines:

- The biggest energy users in Hawaii are conventional electric water heaters, refrigerator/freezers, air conditioners, and swimming pools.
- Small appliances and electronic equipment are economical to operate.
- Most appliances manufactured before 1980 are less energy efficient.
- Check the yellow EnergyGuide labels when you buy a new appliance to compare energy consumption.

## Where Your Electricity Goes

This pie chart shows typical energy use by a family of four. Your usage may differ depending on your household activities as well as the type, number, and age of your appliances. However, this chart is a general guide showing average monthly electricity use.



## Buying Appliances

### What to look for

- Consider the energy efficiency of the item along with the sale price.

Your purchase decision will affect your electric bill month after month, for years to come. It is as important to consider the energy efficiency, as it is to consider the sale price.

An efficient appliance reduces the amount of energy consumed. The higher purchase price on newer, more efficient models will often be recovered by lower monthly bills.

- Look for the ENERGY STAR® label.

ENERGY STAR is promoted by the U.S. Department of Energy and the U.S. Environmental Protection Agency. The ENERGY STAR is only awarded to appliances that significantly exceed the minimum national efficiency standards.

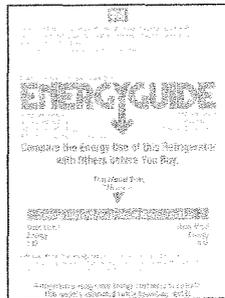


- Look for the yellow and black EnergyGuide label on most major new appliances.

EnergyGuide labels allow you to compare estimated annual operating costs between comparable models in order to select the most efficient appliance for your money.

Federal law requires that EnergyGuide labels be placed on all new water heaters, refrigerators, freezers, clothes washers, dishwashers, and room air conditioners.

EnergyGuide labels are not required on ranges, microwave ovens, and clothes dryers because their energy consumption does not vary significantly between models.



### Information included on all EnergyGuide labels:

- Manufacturer, type of appliance, model number, and capacity
- Estimated average yearly operating costs – This is the large number in the middle of the label. It is based on the estimated hours the appliance is used per year and a standard cost per kWh (kilowatt-hour) rate. The rate may be different from the rate you pay. For room air conditioners, instead of average yearly cost the number is an EER (Energy Efficiency Ratio).

## Buying Appliances *(continued)*

- **Comparisons** – A thick line shows a scale of how the appliance compares with appliances of the same size and style. An arrow indicates where the appliance falls on the scale.
- **Yearly cost table** – This table helps you figure the yearly operating cost for the appliance based on mainland utility rates\* and use habits.  
*\*Remember: your current kWh cost will likely be different.*

### A Special Note on Air Conditioning

- **For window air conditioners under one ton (12,000 Btu/H), we recommend plugging the unit into a dedicated outlet.** Do not use power strips or extension cords as they may overheat and become a fire hazard.
- **For all air conditioners greater than one ton of cooling, you should have a qualified electrician install a dedicated circuit for the unit.** Before you make that purchase, consider contacting your electric company's customer engineering department to have a representative determine if your electrical service can accommodate the unit. When a large air conditioner starts, it will draw a large amount of inrush current that could cause power quality problems not only within your home, but your neighbors' homes as well. Typical problems include voltage sags and flicker that may affect lights and sensitive electronic equipment. An upgrade to your electrical service may be in order and this upgrade could involve the electric company's transformer and service wiring.
- **If an upgrade in electrical service is needed (upgrading from 60 amps or 100 amps to 200 amps for example), the customer is responsible for the following costs:**
  - Purchase and installation of a new meter socket;
  - New meter socket must be rated for 200 amps;
  - New service drop (larger wires) to provide more capacity;
  - Specific requirements as per your electric company's customer engineering department.

- **Please bear in mind that very large air conditioners above three tons of cooling capacity may cause power quality problems that may not be resolved by a service upgrade.** Instead of a single large unit to cool several rooms, consider installing smaller units to cool individual rooms. In addition to reducing inrush current and the resulting voltage drop in your home, this will save you energy by allowing you to cool only the rooms that you need to cool.

## Clothes Dryer

### ENERGY USE

The estimated energy use for an electric clothes dryer is about 80 to 96 kWh/month.\*

*\*Based on eight 40-minute loads a week – 2.5 to 3 kWh per load*

8 loads x 2.5 kWh x 4 weeks = 80 kWh.

### TIPS FOR BUYING CLOTHES DRYERS

- **Select a clothes dryer with energy-efficient features** such as a moisture sensor control and a cool-down cycle. The energy efficiency of dryers varies very little. (That's why EnergyGuide labels are not required on clothes dryers.) The most important energy savings will come from the features available on the dryer and how you use it.
  - **Look for a clothes dryer with a moisture sensor feature.** A moisture sensor automatically turns the dryer off as soon as the clothes are dry. Without a moisture sensor, the dryer often keeps running even after the clothes are dry.
  - **Look for a dryer with a “cool-down” cycle.** A cool-down cycle (sometimes known as “permanent press”) tumbles clothes in cooler air during the last five to ten minutes of operation. This feature saves energy and reduces wrinkling. Some dryers have a “fluff” cycle that tumbles the clothes periodically at the end of the cycle if the clothes are not removed right away. This helps reduce the need for ironing, which is another energy user.
- **Check to make sure the clothes dryer's voltage matches the voltage supplied.**

## Clothes Dryer (continued)

### TIPS FOR USING CLOTHES DRYERS

Some clothes dryer features help conserve energy, but the way you use your dryer also helps a great deal.

- **Clean the dryer's lint filter** after every load. Lint restricts air circulation, requiring the dryer to run longer, and is a fire hazard.
- **Vent the dryer to the outside** to remove excess heat and moisture. Check the vent or duct occasionally for obstructions, which can add to drying time and energy used.
- **Try not to overdry your clothes.** Using your auto-dry setting will help. If you don't have this setting and have to use a timer, set it for less drying time. Most people overestimate drying time, which wastes a lot of energy. Try taking clothes out when they are slightly damp and hanging them up. This reduces the need for ironing, another energy user. Overdrying causes shrinkage, more static electricity, and more wear and tear on your clothes.
- **Dry full loads** instead of several smaller loads as this wastes energy. Try combining two washer loads into one dryer load. But be careful not to overload the dryer as this will cause wrinkling and uneven drying. Air needs to be able to circulate freely for adequate drying.
- **Remove clothes promptly** to minimize wrinkling and the need to iron them.
- **Dry loads in succession** to use the retained heat in the dryer.
- **Avoid running the dryer unnecessarily** for one or two items.
- **Select the proper temperature setting** for the fabric being dried to avoid overdrying and wasting energy.
- **Separate clothes by similar type and fabric and dry similar clothes together** since different fabrics often have different drying times. For example, lightweight synthetic fibers dry much faster than cotton bath towels.
- **Never add wet items** to a dryer load that is partially dried. The added moisture in the dryer will increase the drying time significantly.
- **Use a solar clothes dryer (clothes line).** Take advantage of Hawaii's fresh trade winds and sunshine by hanging clothes on a clothesline instead of using a dryer. You'll save energy—and wear and tear on your clothes!

## Clothes Washer

### ENERGY USE

The average family does about 392 loads of laundry per year. That's a lot of water and energy! The U.S. Department of Energy set federal minimum standards for residential clothes washers that mandated manufacturers to improve efficiency by 20% by 2004 and then by another 15% by 2007.

- The estimated energy use for a clothes washer is about 11 kWh/month\* (excluding hot water energy needs).

\* Use is based on eight loads a week – about 1/3 kWh per load for operation of the motor.

$$8 \text{ loads} \times 1/3 \text{ kWh} \times 4 \text{ weeks} = 10.6 \text{ kWh}$$

- **If clothes are washed in warm or hot water, up to 90% of the energy used goes toward heating the water.**
- **Estimated hot water usage:**
  - Hot wash/warm rinse – 20 to 40 gallons\*\*
  - Hot wash/cold rinse – 10 to 30 gallons\*\*
  - Warm wash/warm rinse – 15 to 30 gallons\*\*
  - Warm wash/cold rinse – 5 to 15 gallons\*\*

\*\* The lower figure is for a front-loading washer; the higher figure is for an extra large capacity top-loading washer.

- **Estimated water usage:** A typical top-loading (vertical-axis) washing machine uses:
  - Small setting – 20 gallons
  - Medium setting – 27 gallons
  - Large setting – 34 gallons
  - Extra large setting – 40 gallons

## Clothes Washer (continued)

### TIPS FOR BUYING

Many new energy-efficient, water-conserving clothes washers have been introduced over the past few years and are available in a variety of sizes and configurations, offering a wide range of front-loading and top-loading styles in many different price ranges. These resource-efficient washers use 35-50% less water and 50% less energy per load than the average conventional washer. This adds up to lower energy and water bills, and you'll use less detergent too!

- **Check the EnergyGuide label.** Compare estimated annual energy consumption, including hot water costs.
- **ENERGY STAR clothes washers save energy and even more water.** They often come with a high spin speed that reduces drying time and energy use while drying your laundry. ENERGY STAR qualified clothes washers are available in both top-loading and front-loading designs.
- **Consider a front-loading model.** Clothes washed in front-loading washers last longer (because they are tumbled rather than twisted).
- **Select models that feature water levels and temperature controls.** A water level control allows you to match the amount of water used to the size of each wash load. A water temperature control allows you to select the proper temperature for each load.



### TIPS FOR USING

- **Use a cold water wash whenever possible.** A warm or hot water wash may only be needed for clothes that are soiled with grease or oil, diapers, and white loads. Since water-heating accounts for 90% of the energy used by your washing machine, the best energy conservation strategy involves using cooler wash and rinse cycles and reducing the amount of water used per cycle.
- **Always use cold water to rinse.**
- **Set water level to the size of the load.** Did you know that saving water also saves energy? By conserving water (whether hot or cold) you are saving the energy it takes to pump it, clean it, heat it, and treat it later.

## Clothes Washer (continued)

- **Install your washing machine as close to the water heater as possible** and insulate pipes leading to the machine. This will reduce the amount of heat that escapes from hot water pipes to the washing machine.
- **Turn down the temperature of your water heater.** A temperature of 120°F is enough for your hot water needs. By reducing your hot water temperature, you save energy whenever you wash with hot or warm water. View a comparison chart showing energy savings from lowering your water heater temperature.

| Water Heater Temperature<br>set at 140°F |             |                       | Water Heater Temperature<br>set at 120°F |             |                       |
|--|-------------|-----------------------|--|-------------|-----------------------|
| Wash/rinse<br>settings                   | kWh<br>used | Avg.cost<br>per load* | Wash/rinse<br>settings                   | kWh<br>used | Avg.cost<br>per load* |
| Hot/Hot                                  | 8.3         | \$1.25                | Hot/Hot                                  | 6.5         | \$0.98                |
| Hot/Warm                                 | 6.3         | \$0.95                | Hot/Warm                                 | 4.9         | \$0.74                |
| Hot/Cold                                 | 4.3         | \$0.65                | Hot/Cold                                 | 3.4         | \$0.51                |
| Warm/Warm                                | 4.3         | \$0.65                | Warm/Warm                                | 3.4         | \$0.51                |
| Warm/Cold                                | 2.3         | \$0.35                | Warm/Cold                                | 1.9         | \$0.29                |
| Cold/Cold                                | 0.4         | \$0.06                | Cold/Cold                                | 0.4         | \$0.06                |
| *Cost assumes 15¢ per kWh                |             |                       |  |             |                       |

(Source: Adapted from ACEEE, Consumer Guide to Home Energy Savings, 1999)

Note: These figures are based on a conventional vertical-axis machine; imagine the energy savings you could achieve using a front-loading (horizontal-axis) machine instead!

## Cooling

There are many no-cost or low-cost ways to cool your home that don't require the use of electricity. The Hawaii State Department of Business, Economic Development, and Tourism (DBEDT) together with the Honolulu Chapter of American Institute of Architects (AIA) developed the "**Field Guide for Energy Performance, Comfort, and Value in Hawaii Homes.**" This guide identifies significant opportunities to reduce energy use, improve comfort, lower utility bills, provide value, and improve quality of life for Hawaii's homeowners. The guide is available for download as a PDF document at the DBEDT website (<http://www.hawaii.gov/dbedt/ert/fieldguide/fieldguide.html>) or you may obtain a copy of the report by calling (808) 587-3804.

- **Windows**

- Open windows and use all natural Hawaiian trade winds for cooling whenever possible.
  - Apply window tinting with a shading coefficient of 0.40 or less or install new windows with a Solar Heat Gain Coefficient (SHGC) of 0.40 or less.
  - If the window has a U-factor of 0.65 or less, it qualifies as an ENERGY STAR window in Hawaii's climate. The U-factor indicates how quickly heat is transferred, and a lower number is better.
- **Attic Insulation** – A radiant barrier or insulation in the attic will keep the sun's heat from transferring to your living area. Look for an emissivity of 0.05 or less in radiant barriers and an R-19 value for insulation. Insulating material today comes in many forms, some with environmentally friendly pest control.
  - **Solar-Powered Attic Fans** – **Solar-powered fans** use clean, free energy from the sun to draw out hot air and reduce attic temperature by as much as 40°. These fans work hardest when the sun is strongest. Solar-powered attic fans qualify for the state's 35% energy tax credit.
  - **Ceiling Fans** – **Ceiling fans** use far less energy than air conditioners. Choose ENERGY STAR models that move more cubic feet of air with less energy. Be sure to use cooler burning compact fluorescent lamps for fans that have light fixtures.

## Cooling (continued)

### • Landscaping

- Use trees, shrubs, or trellises to provide shade on the warmer east, west, and south-facing sides of your home.
- If you use an air conditioner, provide it with shade and plenty of air circulation to increase its efficiency.
- Limit hard surfaces that contribute to heat.
- Choose drought-tolerant native species and avoid invasive species that can damage Hawaii's ecosystems and watershed areas.

### • New Construction

- If you're building a new home, ask your builder to orient your home with the longer sides facing within 15° of true north. This alignment limits the amount of heat gained from the morning and afternoon sun. It also allows you to take advantage of Hawaii's northeast tradewinds.
- Warm rooms like kitchens and laundry areas should be on the downwind side of the home to allow heat to easily escape. Include generous roof overhangs to shade windows from direct sunlight.

## Air Conditioners

Air conditioning has increased energy use, especially during the last 30 or so years. More homeowners are installing and using air conditioners, and many new homes are being built with air conditioners already installed.

### ENERGY USE

- The energy use of air conditioners depends on several factors: hours of use, size, efficiency, and condition of the components.
- The cooling capacity of an air conditioner is expressed in British thermal units per hour (Btu/H).
- The formula for calculating the cost of operating an air conditioner is:

$$\text{Cost of operation} = \frac{\text{wattage}}{1000} \times \text{hours used} \times \text{cost per kWh}$$

## Cooling (continued)

Sometimes the wattage of the air conditioner is not provided on the unit's nameplate, but the unit's amps and volts are. You can calculate the wattage if you know the amps and volts:

**approximate power in watts = amps x volts**

Or, you can calculate watts if you know the cooling capacity (Btu/H) and the Energy Efficiency Ratio (EER) rating of the air conditioner:

$$\text{watts} = \frac{(\text{Btu/H})}{\text{EER}}$$

Here are a few examples that show how to calculate the cost of operating an air conditioner.

**Example 1: Use this if you know the wattage of your air conditioner**

Watts = 2525

Number of hours used = 4 hours

Cost per kWh = \$0.15

$$\begin{aligned} \text{Cost of operation} &= \frac{\text{wattage}}{1000} \times \text{hours used} \times \text{cost per kWh} \\ &= \frac{2525}{1000} \times 4 \text{ hours} \times \$0.15 \\ &= \$1.52 \end{aligned}$$

**Example 2: Use this if you don't know the wattage of the air conditioner, but you know the amps and volts.**

Amps = 7

Volts = 115

Number of hours used = 4 hours

Cost per kWh = \$0.15

**First determine the watts**

$$\begin{aligned} \text{approximate power in watts} &= \text{amps} \times \text{volts} \\ &= 7 \text{ amps} \times 115 \text{ volts} \\ &= 805 \text{ watts} \end{aligned}$$

## Cooling (continued)

Then calculate the cost of operation:

$$\begin{aligned}\text{Cost of operation} &= \frac{\text{wattage}}{1000} \times \text{hours used} \times \text{cost per kWh} \\ &= \frac{805}{1000} \times 4 \text{ hours} \times \$0.15 \\ &= \$0.48\end{aligned}$$

**Example 3: Use this if you know the cooling capacity (Btu/H) and the EER of the air conditioner.**

Cooling Capacity = 5,600 Btu/H  
EER in Btu/H per watt = 11  
Number of hours used = 4 hours  
Cost per kWh = \$0.15

**First determine the watts**

$$\begin{aligned}\text{watts} &= \frac{(\text{Btu/H})}{\text{EER}} \\ &= \frac{(5600\text{Btu/H})}{11 \text{ EER}} \\ &= 509 \text{ watts}\end{aligned}$$

**Then calculate the cost of operation:**

$$\begin{aligned}\text{Cost of operation} &= \frac{\text{wattage}}{1000} \times \text{hours used} \times \text{cost per kWh} \\ &= \frac{509}{1000} \times 4 \text{ hours} \times \$0.15 \\ &= \$0.31\end{aligned}$$

## TYPES OF AIR CONDITIONERS

- **Room (or Window)** – A room air conditioner cools a single room. The unit is mounted in a window or through the wall.
- **Portable** – A portable air conditioner cools a single room, but unlike room air conditioners, it does not require installation in a window or wall and can be moved from one room to the next. It does, however, still need to have the hot air vented outdoors. Most units come with window venting kits.

## Cooling (continued)

- **Split system** – A split system cools one or more rooms. The compressor is placed outdoors and the fan coil units are placed indoors. The two are connected by refrigerant lines. These units are quieter than room air conditioners and do not take up window space. They are usually mounted on the ceiling, floor, or wall.

For more information on ductless (split system) air conditioning units, visit the Air Conditioning & Refrigeration Institute's website (<http://www.ari.org/consumer/ductless/>).

- **Central** – A central air conditioner cools the entire house. An air distribution system carries cool air to all rooms in the house.

### TIPS FOR BUYING AIR CONDITIONERS

- **Look for the ENERGY STAR label on products.** Earning the ENERGY STAR means a product meets strict energy efficiency guidelines set by the Environmental Protection Agency and the U.S. Department of Energy. ENERGY STAR qualified room air conditioners use at least 10% less energy than conventional models.
- **Understand that an air conditioner's cooling capacity is expressed as Btu/H.** An air conditioner's cooling capacity is the amount of heat and moisture it can move from indoors to outdoors. Cooling capacity is expressed in British thermal units per hour (Btu/H). The higher the Btu/H, the more cooling capacity the unit provides.
- **Make sure to size the air conditioner to the area it has to cool.** The correct size needed to cool a given space is determined by performing a cooling load calculation. Cooling load estimates are best performed by consulting engineers or an air conditioner vendor's professional staff. Cooling load depends on a number of factors: square footage to be cooled, height of ceiling, insulation of walls, window area, direct sun, occupants in area, and temperature and humidity of the outside air. Give information on these factors to your vendor to help determine the size (cooling capacity) that will fit your needs.
- **Choose the smallest system** that is adequate to cool the required space during a hot day.
  - A properly sized air conditioner will lower the temperature to an acceptable level and dehumidify the area as well.



## Cooling (continued)

- An oversized air conditioner may not be the most economical and efficient way to cool your home. The purchase cost is higher, and it will cost more to run. Frequent on/off cycling to adjust the temperature in the room may increase wear and tear on the compressor. And an oversized air conditioner may not remove moisture as effectively as a properly sized unit, making the room feel cold and clammy. In Hawaii's humid climate, removing moisture is an important aspect of maintaining a comfortable home.
- An undersized unit will not lower the temperature to an acceptable level.
- *HECO's website at [www.heco.com](http://www.heco.com) includes a handy calculator that can help you select the right air conditioner for your home. Click on "Residential services," then "Household energy," then "Choosing an Air Conditioner" to access the calculator.*
- **Check the EnergyGuide label.** An air conditioner's operating efficiency is measured by its Energy Efficiency Ratio (EER) or *Seasonal Energy Efficiency Ratio (SEER)*.
- The EER is used to rate room air conditioners and small split systems. It is the cooling capacity (Btu/H), divided by the power consumption (wattage rating).

$$\frac{10,000 \text{ Btu/H}}{1000 \text{ watts}} = 10.0 \text{ EER}$$

- The higher the EER, the more energy efficient the air conditioner. All air conditioners manufactured after October 2000 must have an EER of 9.7 or higher. A model with an EER over 10.5 is very energy efficient.

In general, air conditioners with higher EER ratings come with a slightly higher price tag. However, the higher initial cost to purchase an energy-efficient model will be repaid several times over the life span of the air conditioner. We suggest that you buy the most energy-efficient air conditioner you can afford, especially if you plan to use it frequently.

- The SEER is used to rate central air conditioners and large split systems. It is the cooling output divided by the power input for an average U.S. climate. An SEER of 12 or more is good, and 14 or more is excellent. In 2006, the U.S. Department of Energy requires all new central and large split systems to have an SEER of 13 or better.

## Cooling (continued)

- **Note the voltage of the air conditioner unit** before making a purchase. The standard household receptacle has a connection for a 115-volt branch unit circuit. Large room units rated at 115 volts may require a dedicated circuit. Room units rated at 230 volts may require a special circuit. See page 21 for important information you should keep in mind when considering the purchase and installation of a large air conditioner.
- **Look for energy-saving features:**
  - A fan-only switch to let you use the unit for night ventilation if cooling is not needed
  - A filter-check light to remind you to check and clean or replace the filter after a predetermined number of hours of operation
  - A filter that slides out easily for regular cleaning: Clean filters help keep your unit in good working condition.
  - Consider a unit with controls. Controls such as a digital readout for the thermostat settings and a built-in timer can help you adjust your unit to use less energy.

### TIPS FOR USING AIR CONDITIONERS

- **Use ceiling fans instead of air conditioners** when possible. Fans do not remove heat from the room, but they can provide a cooling effect by circulating air and they are less expensive to operate.
- **If you decide to use your air conditioner, consider using ceiling fans along with it.** Ceiling fans can help circulate air in the house and may allow you to raise the thermostat setting with no reduction in comfort.
- **For economical operation, turn on your air conditioner only when your home is occupied.** An air conditioner will cool the air in your home fairly quickly. Consider installing a programmable thermostat. These allow you to set the time when the air conditioner will turn on, such as 30 minutes before you arrive home.
- **Don't set your thermostat at a colder setting than normal when you turn on your air conditioner.** It will not cool your home any faster and could result in excessive cooling, and therefore, unnecessary expense.
- **Install the air conditioner away from, or shaded from, the sun.**
- **Set the thermostat at the warmest comfortable setting.**
- **Keep the room as cool as possible** by drawing drapes or blinds to block out the sun.

## Cooling (continued)

- Use the **high blower or fan setting** on extra warm days.
- **Shade windows** with trees, shrubbery, or awnings.
- **Clean filter and baffles** regularly. Replace filters that look worn.
- **Close windows and doors** when the unit is running. Window air conditioners are designed to cool one enclosed room area.
- **Use kitchen, bath, and other ventilation fans wisely.** In just one hour these fans can pull out a houseful of cooled air. Turn fans off as soon as they have done the job.

### A Special Note on Air Conditioning

- **For window air conditioners under one ton (12,000 Btu/H), we recommend plugging the unit into a dedicated outlet.** Do not use power strips or extension cords as they may overheat and become a fire hazard.
- **For all air conditioners greater than one ton of cooling, you should have a qualified electrician install a dedicated circuit for the unit.** Before you make that purchase, consult with a licensed electrician who can help you determine if your electrical service can accommodate the unit. When a large air conditioner starts, it will draw a large amount of inrush current that could cause power quality problems not only within your home, but your neighbors' homes as well. Typical problems include voltage sags and flicker that may affect lights and sensitive electronic equipment. An upgrade to your electrical service may be in order and this upgrade could involve the electric company's transformer and service wiring.
- **If an upgrade in electrical service is needed (upgrading from 60 amps or 100 amps to 200 amps for example), the customer is responsible for the following costs:**
  - Purchase and installation of a new meter socket
  - New meter socket must be rated for 200 amps
  - New service drop (larger wires) to provide more capacity
  - Specific requirements as per your electric company's customer engineering department
- **Please bear in mind that very large air conditioners above three tons of cooling capacity may cause power quality problems that may not be resolved by a service upgrade.** Instead of a single large unit to cool several rooms, consider installing smaller units to cool individual rooms. In addition to reducing inrush current and the resulting voltage drop in your home, this will save you energy by allowing you to cool only the rooms that you need to cool.

## Cooking

### ENERGY USE FOR COOKING

In the past, cooking was limited to using the range cooktop and the oven. Today the choice of cooking appliances has grown to include separate ovens with separate cooktops, convection and microwave ovens, and other small appliances like toaster ovens, and slow-cook crock-pots.

- Cooking accounts for about 8% of the average household's energy use.
- The estimated energy use for an electric range is between 30 and 60 kWh/month. This varies with the number of hours the range and oven are used. If small appliances are frequently used for cooking meals, this figure may be lower. If the range and oven are used to cook all daily meals, this figure may be higher.
- The wattage of the microwave oven and the number of minutes of use determine its monthly operating cost. A 1500-watt microwave oven used on high power for 20 minutes a day, will use about 15 kWh/month.

### TYPES OF RANGES (COOKTOPS)

- **Conventional coil element** – A conventional coil element heats up quickly and accommodates the widest variety of cookware.
- **Solid disk element** (cast iron disk) – A solid disk element heats up more slowly than the conventional coil element, but retains heat well, allowing the element to be turned off before cooking is completed. Disks are easy to clean. Heavy, flat-bottomed metal cookware is necessary for good heating speed.
- **Ceramic glass** (coil element directly under ceramic glass) – The element in a ceramic glass cooktop heats up faster than the solid disk element and retains heat well, allowing the element to be turned off before cooking is completed. Heavy, flat-bottomed cookware is necessary for good heating speed.
- **Halogen** (halogen lamps under a ceramic glass surface) – The halogen lamp in a ceramic glass cooktop glows almost immediately when turned on. Higher wattage elements have quicker heat-up times, but the heat still comes from the contact of the pan with the hot ceramic glass surface. Heavy, flat-bottomed cookware is necessary for good heating speed.
- **Induction** (elements transfer electromagnetic energy directly to the pan) – An induction element heats up instantly and is very energy efficient. However, magnetic cookware (cast iron, stainless steel, enameled iron, etc.) is required to generate heat.

## Cooking (continued)

### TYPES OF OVENS

- **Conventional (thermal)** – A conventional oven has two heating elements: a heating element at the bottom of the oven and a broiler element at the top. When baking, only the heating element at the bottom of the oven will cycle on and off to maintain the desired temperature. The broiler element at the top turns on only when the oven is preheating, otherwise, it remains off. When broiling, only the heating element at the top will turn on.
- **Convection** – A convection oven uses a fan to constantly move the air inside and creates an even cooking temperature throughout the oven. As a result, foods cook more evenly and quickly—about 30% faster than conventional ovens. Some convection ovens have a selector switch that allows you to turn off the convection feature when you don't want to use it.
- **Microwave** – A microwave oven uses microwaves to heat food. Microwave ovens use less energy and time than conventional ovens and are ideal for reheating foods and for small cooking jobs. Microwave ovens also produce less heat, helping to keep the kitchen cool.
- **Speed-cook** – A speed-cook oven uses powerful halogen lamps to bake, broil, brown, roast, and grill food with no preheating. Some models cook with a combination of halogen light and microwave. A speed-cook oven can cook foods up to eight times faster than a conventional oven. Most speed-cook ovens can be converted into a microwave oven with the flip of a switch.
- **Combination** – A combination oven uses a combination of conventional thermal, and/or convection, and/or microwave features. By combining convection, microwave, and radiant heat, these ovens can cook up to five times faster than conventional ovens. These ovens can be converted into a convection oven and a broiler with the flip of a switch.

### TIPS FOR BUYING COOKING APPLIANCES

- **When it comes to kitchen ranges, energy efficiency does not vary much from model to model;** the technology is basically the same in most designs of conventional ranges. That's why **EnergyGuide** labels are **not required** on ranges. It is the features of the range and how you use the range that improve its energy efficiency.
- **Self-cleaning ovens have extra insulation** that increases efficiency during normal baking. This normally offsets the additional cost of using the self-cleaning feature.

## Cooking (continued)

- **Consider some of the newer technologies now available for ovens.** Some new technologies can cook items up to eight times faster (see the section on “Types of Ovens” on page 23).
- **Choose the right type of cooktop for the type of cookware you use.** The efficiency of a surface unit depends on the type of cooktop, as well as the cookware used. Induction cooktops require magnetic cookware (cast iron, stainless steel, enameled iron, etc.) to generate heat.
- **Check to make sure that the range’s voltage matches the voltage supplied.**

### TIPS WHEN COOKING – GENERAL

- **Prepare several batches of food at a time**, such as stews or casseroles. Freeze the extra for future use.
- **Thaw frozen food before cooking.** Frozen food requires more energy to cook.
- **Keep the inside surface of the microwave clean** to allow for more efficient cooking.
- **Cook food in serving dishes** to save time and reduce the amount of hot water needed for dishwashing.
- **Use small appliances when cooking small quantities of food.** Small appliances (microwave ovens, toaster ovens, slow cookers, crockpots, etc.) often have enclosed heating elements and will usually use less energy when cooking. See below for a comparison chart of the energy costs of several methods of cooking the same meal.

### Comparison table of the energy costs of cooking the same meal by several methods

| Appliance          | Temperature | Time    | Energy   | Cost* |
|--------------------|-------------|---------|----------|-------|
| Electric oven      | 350°F       | 1 hr.   | 2.0 kWh  | 30¢   |
| Convection oven    | 325°F       | 45 min. | 1.39 kWh | 21¢   |
| Cooktop/frying pan | 420°F       | 1 hr.   | 0.9 kWh  | 14¢   |
| Toaster oven       | 425°F       | 50 min. | 0.95 kWh | 14¢   |
| Crockpot           | 200°F       | 7 hrs.  | 0.7 kWh  | 11¢   |
| Microwave oven     | “High”      | 15 min. | 0.36 kWh | 5¢    |

\*Cost assumes 15¢/kWh for electricity

(Adapted from ACEEE, Consumer Guide to Home Energy Savings, 1999)

## Cooking (continued)

### TIPS WHEN USING THE COOKTOP

- **Use cookware with a flat bottom for efficient heat transfer.** Cookware should also have straight sides and a tight-fitting cover.
- **Cover cookware whenever possible.** Food will cook faster, using the steam created inside.
- **Match the size of the cookware to the surface unit.** For example, a six-inch pan on an eight-inch burner will waste 40% of the energy produced by the burner. Try to use the smallest pan necessary to do the job, since it requires less energy. The bottom of the pan should cover the element, but not extend more than one inch beyond the outer ring of the element.
- **Select cookware that conducts heat well.** Aluminum and copper are good conductors of heat. Stainless steel is heavy and durable, but is not a good heat conductor unless it has a copper or aluminum bottom. Cast iron heats slowly and is best when used for long cooking processes. Glass and ceramic are poor conductors of heat for surface cooking, but are good absorbers of oven heat.
- **Turn the heat down when food reaches the proper cooking temperature** and use the lowest possible heat level to complete cooking. Turn the surface unit off a few minutes before the food is completely cooked; retained heat will complete the cooking.
- **Keep reflector (drip) pans clean.** This will allow them to reflect heat better and reduce cooking time.
- **Use pressure cookers whenever cooking items that take a long time.** They can save energy by significantly reducing cooking time.
- **Boiling water with an electric kettle** is much faster than boiling water in a pan on a cooktop and uses a lot less energy. Buy one with an “automatic off” feature that turns off when the water has reached boiling point. This will save energy and will prevent the kettle from boiling dry.

### TIPS WHEN USING THE OVEN

- **You don't really need to preheat your oven,** except when making baked products like breads, cakes, cookies, and pastries. If you do need to preheat, ten minutes is usually enough time to reach the desired temperature.
- **Turn off the oven before your food is completely ready** when cooking roasts, turkeys, or casseroles and let the heat in the oven finish cooking the item. You can usually turn off the oven five minutes before the cooking time is up.

## Cooking (continued)

- **No Peeking!** Opening the oven door wastes energy by letting out heat. In fact you could lose up to 20% of the heat each time you open the door. If you're the type of cook that needs to open the oven door every few minutes to check on the food inside, use the oven window to peek inside, or use a timer to monitor cooking time.
- **If you cannot bake all of your dishes at one time, plan your cooking** so that you can put another dish in the oven right after the first is done, when the oven is still hot. It is also a good idea to plan your cooking so that foods requiring the highest temperature are cooked first, then work down to those requiring lower temperatures.
- Better yet, **organize your baking** so that you can cook more than one meal at the same time. You can refrigerate or freeze the extra food for another meal. That way you are using the heat in the oven for more than one cooking purpose. This saves energy and cooking time. Remember, it doesn't take as much energy to reheat food as it does to cook it.
- **Keep pans in the oven separated** from each other and don't let them touch the oven walls to maintain proper heat circulation when you are cooking several items.
- **Don't cover your oven racks with foil** because it blocks the flow of hot air. Food cooks more quickly and efficiently when the heated air can circulate freely. Staggering pans on upper and lower racks improves airflow.
- **Use glass or ceramic pans in your oven when possible.** You can turn down the temperature by about 25° F, and foods will cook just as quickly.
- **Set the self-cleaning cycle immediately after baking.** When the oven is still hot, less energy is required to heat the oven to the cleaning temperature.
- **Occasionally check the seal on your oven door for cracks or tears.** Even a small tear or gap can allow heat to escape. In addition, a clean seal will provide better heat retention.
- **Evaluate the cooking temperature and cooking time when using a convection oven.** A convection oven contains a fan that circulates air evenly throughout the oven. Cooking temperatures can often be lowered and cooking times shortened, thus saving money.

# Dishwasher

## ENERGY USE

- The estimated energy use of an automatic dishwasher is about 20 to 30 kWh/month\* (excluding hot water).

*\*Energy use is based on one load of dishes a day. The lower figure applies if the air dry cycle is selected or the dishwasher is stopped at the end of the final rinse and the dishes are allowed to air dry.*

- The dishwasher uses about 9 to 16 gallons\*\* of hot water per cycle.

*\*\*The lower figure applies if a short wash cycle is selected.*

- About 80% of the energy needed to operate a dishwasher is used to heat the water. So the most efficient dishwashers are the ones that use the least hot water.

## TIPS FOR BUYING

- **Check the EnergyGuide label.** Compare operating costs prior to purchasing a dishwasher.
- **Look for the ENERGY STAR mark.** ENERGY STAR qualified dishwashers use 25% less energy than the federal minimum standard for energy consumption. Several models utilize sensors to adjust water to the needs of the dishes, using only what is necessary.
- **You can save more than \$25 a year in energy costs** by replacing a dishwasher manufactured before 1994 with an ENERGY STAR qualified dishwasher.
- **Today's dishwashers have improved washing systems that eliminate the need for prerinsing.** Prerinsing nearly doubles your hot water consumption, eliminating any energy savings.
- **Consider purchasing a dishwasher with a booster heater.** A booster heater is an important energy-saving feature. It raises the temperature of water entering the dishwasher to 140°F, the temperature necessary to clean greasy dishes. If your dishwasher has this booster heating feature, you will be able to set the temperature on your water heater as low as 120°F, saving energy and minimizing the possibility of accidental scalding. The booster heater feature is particularly desirable if your home is equipped with a solar or heat pump water heater.



## Dishwasher (continued)

- **Look for an energy-saving cycle selector.** Sometimes known as “light wash” or “econo” or “short” cycle, these selections use less hot water and are suitable for times when dishes are not very dirty.
- **Look also for air dry features.** An air dry selector also helps to save energy. It automatically turns the heat off during the drying cycle, allowing dishes to air dry.
- **Choose a model that uses the least amount of water.** Some units fill up and drain five times during the dishwashing process. This can use 9 to 16 gallons of water for one load! However, some manufacturers don’t readily provide this information.

### TIPS FOR USING DISHWASHERS

- **Run the dishwasher only when there is a full load.** Unless your dishwasher comes equipped with sensors, it uses the same amount of water whether it is half full or completely full.
- **You don’t need to prerinse your dishes** before putting them in the dishwasher. For the amount of time and water it takes to prerinse, you might as well wash your dishes by hand. Modern dishwashers do an excellent job of washing even the most soiled dishes. Make sure to scrape off food and empty liquids, and the dishwasher will do the rest. If you must prerinse, use cold water for the job.
- **Choose an energy-saving wash cycle.** Most dishwashers have different cycles to choose from. Select the “light wash” or “econo” or “short” cycle to save energy.
- **Let your dishes air dry.** Most new dishwashers have an energy saving “no heat drying” feature—use it. If yours doesn’t, you can stop the dishwasher after the final rinse cycle and open the door to allow air drying. This method is just as effective and requires no energy.

# Lighting

## ENERGY USE

Energy use for lighting has increased dramatically in the last decade and is expected to increase even more, primarily because of the increase in home size. However, improvements to the energy efficiencies in current lighting technologies, as well as new technologies, help reduce energy use.

- **Incandescent lights, which include halogen lights, are NOT energy efficient**, but are the most familiar type of light bulb used in almost all homes and are most commonly found in retail stores around the island. The reason this type of lighting is inefficient is because only 10% of the electricity is actually used to produce light, the remaining 90% produces heat.
- **Compact fluorescent lamps (CFLs) ARE energy efficient.** Compact fluorescents typically use 66% less energy than standard incandescent light bulbs and can last as long as three to four times longer. This makes them perfect for areas that are hard to reach or for light fixtures used most often. They're also great for those lights you want to run for hours on a timer for safety while you're away. Save money with lower electricity costs and less frequent bulb replacements. Changing just one 100-watt bulb to a CFL equivalent, based on four hours use per day, can save 108 kWh and \$16\* per year. (\*Based on \$0.15 per kWh)
- The estimated energy use for lighting your home is about 50 to 100 kWh/month.

For a general estimate, the following can be used:

- 1 bedroom (2 people) – 50 kWh/month
  - 2 bedroom (2 to 3 people) – 65 kWh/month
  - 3 bedroom (3 to 5 people) – 80 kWh/month
  - 4 to 5 bedroom (6 to 8 people) – 100 kWh/month
- Kilowatt-hour usage will be less if fluorescent lighting is used. Compact fluorescent lamps generally use one-third of the energy used by incandescent bulbs and they give the same amount of brightness.

## Lighting (continued)

### TYPES OF BULBS (LAMPS)

- **Incandescent** – An incandescent bulb produces light by using electric current to heat a metallic filament until it glows.
- **Fluorescent** – A fluorescent bulb produces light when an electric current flows through a glass tube. These are commonly found in offices and schools. Fluorescent lamps are three to four times more efficient and last up to ten times longer than incandescent bulbs. If you use this type of lighting, it is best to get a T8 lamp with an electronic ballast; older types use more energy.
- **Compact fluorescent** – A compact fluorescent bulb produces the same warm color of light as incandescent bulbs. It is a small-sized, energy-efficient, long-lasting substitute for the incandescent bulb. Compact fluorescent bulbs are available as a complete screw-in unit, or as a special screw-in base with tubes that snap in. Compact fluorescent lamps require a ballast to operate properly.
- **Halogen or quartz halogen** – A halogen bulb produces light like an incandescent bulb, but it is slightly more efficient. The conventional incandescent bulb filament deteriorates, leading to a darkened bulb with reduced brightness. These bulbs have halogen added, making the filament last longer and giving the bulb a longer life. The small Halogen bulbs, called MR-16, are very popular, but they should be used very sparingly around the home. They are not intended to be used as general lighting, but as accent lighting. These lamps produce large amounts of heat and use large amounts of energy.
- **Solar-powered outdoor lights** – A solar-powered light uses photovoltaic (PV) panels to collect energy from the sun that is stored in a battery. At night, the stored electricity is used to power the lights. Some models turn on automatically with light sensing controls (i.e., turn on when it gets dark) or with motion sensing controls (i.e., turn on when movement is detected).

### TIPS FOR BUYING

- **Choose fluorescent over incandescent bulbs.** Use four-foot T8 fluorescent fixtures with reflective backing and electronic ballasts for your workroom, garage, and laundry areas.
- **Use compact fluorescent lamps** wherever possible. CFLs are now available in different shades of white, such as warm white, which most families select for home use. You can get CFLs for indoor and outdoor use and you can now find types to fit almost any light fixture in your home. Check the package to determine what type of CFL is best suited to your needs:

## Lighting (continued)

- Pick a CFL with a well-known brand name for high quality and long life.
  - Most CFLs list their wattage equivalency to a standard incandescent bulb. Or, use the “watt four” rule: divide the watts of the bulb you are replacing by four and buy the nearest wattage CFL.
  - All CFLs show lumens, or light output. Get a CFL with about the same lumens as the bulb you are replacing.
  - CFLs could last four to seven years for home use.
  - Warm white light is best for inside your home; it is soft and inviting, like you are used to.
  - Be sure to take into consideration where you will be using CFLs. Not all CFLs are made for enclosed fixtures or for outside, wet locations. CFLs are available for dimmable and three-way fixtures, so check the box carefully for the features you require.
  - Look for the UL label. UL stands for Underwriters Laboratories, an independent organization that has been testing product safety for over 100 years.
- **Replace halogen torchiere lamps with compact fluorescent torchiere lamps.** Halogen torchiere lamps generate excessive heat that can create fire hazards. Compact fluorescent torchiere lamps are safer and use 60% to 80% less energy and can produce more light (lumens) than the halogen torchieres.
  - **When using flood lamps or PAR lamps,** CFL flood lamps are the most energy-saving choice, followed by halogen flood lamps. The least energy-saving are the incandescent flood lamps.
  - **When shopping for a new light fixture, look for the ENERGY STAR symbol.**
    - Lighting fixtures that have earned the ENERGY STAR combine high performance, attractive design, and the highest levels of energy efficiency, so they save energy, save money on utility bills, and help protect the environment.
    - ENERGY STAR fixtures can now be found at most home centers, lighting showrooms, and specialty stores. Look for qualified fixtures for the following applications: torchieres, under and over cabinets in the kitchen, ceiling mounted, wall sconces, suspended fixtures, and outdoor lighting, including motion sensor fixtures.
    - ENERGY STAR qualified fixtures distribute the light more efficiently and evenly than standard fixtures and they carry a two year warranty—double the industry standard.

## Lighting (continued)

### TIPS FOR USING

- **Turn lights off when you leave the room.** Turning a light off and on will save more money than the cost of replacing the bulb.
- **Install motion/occupancy detectors inside and out.** Cutting use of a 150-watt outdoor flood light from six hours to one hour per night by installing a motion sensor saves up to 270 kWh and \$41\* per year. Switching off a 10-watt bulb for just one, eight-hour day per week can save 41 kWh and over \$6\* per year. (\*Based on \$0.15 per kWh)
- **Make use of natural light during the day.** Open drapes and curtains in your home. Rearrange your room to take advantage of natural light; try putting your favorite reading chair by the window. Explore the multitude of new styles of window covering and window tinting to take full advantage of natural lighting. Nothing is more pleasing and efficient than natural light.
- **When redecorating or moving into a new place, paint the walls in your home a light color to make the best use of natural lighting.** Also, with lighter walls, you can achieve a 25% reduction in the amount of watts needed to light the room. You may also seek the advice of an interior lighting designer who can help you select different tints of the same paint color to achieve even less need for lighting fixtures and make the room feel large or visually more stimulating.
- **If you can't switch your light fixtures over to compact fluorescent lights, use incandescent lights wisely. Use a single high-wattage bulb rather than several low-wattage ones** (unless the fixture specifies a particular wattage bulb). Higher wattage incandescent bulbs are more efficient than lower-wattage bulbs. One 100-watt bulb produces more light than two 60-watt bulbs and uses less energy.
- **Concentrate light where it is actually needed and reduce background light levels.** This strategy is called task lighting. Install lights to illuminate your desk or the kitchen table where you read the newspaper. Halogen lights are great for delivering light right where you need it.
- **For outdoor lights, use solar-powered lights for maximum energy savings.**
- **Consider using four-watt mini-fluorescent or electro-luminescent night lights.** Both lights are much more efficient than their incandescent counterparts. The luminescent lights are cool to the touch.

## Lighting (continued)

- **Use dimmers to allow you to control the level of light in the room.** The dimmer the light, the less electricity used. Often, you don't need lights on at their full intensity to be comfortable. Never use a compact fluorescent in circuits that have dimmers unless the lights are specially designed for that purpose. Check the CFL's package for that information.
- **Clean light bulbs and fixtures regularly.** Dust can cut the amount of brightness coming from the bulbs.
- **Use low wattage bulbs** if bright light is not necessary. However, never sacrifice light that is needed for reading, safety, or for the protection of your home.
- **Install a compact fluorescent light bulb instead of a long-life incandescent bulb for light fixtures that are hard to reach.** The only time to use a long-life incandescent bulb is if the fixture is very small and a compact fluorescent bulb will not fit inside it. Keep in mind that long-life incandescent bulbs are generally less efficient than ordinary bulbs. The life of the bulb is extended at the sacrifice of brightness.
- **Try to avoid having too many lights controlled by a single switch.** This might mean that you will have more lights on than you really need.

## Refrigerator/Freezer

### ENERGY USE

- A refrigerator/freezer accounts for a large part of monthly energy use. If there are less than three people in a household, the refrigerator/freezer may use more energy than the water heater—especially if it is a model manufactured before 1980.
- A refrigerator/freezer can use anywhere from 14 to 300 kWh/month.
- The energy efficiency of refrigerators and freezers has improved dramatically over the past three decades. A typical new refrigerator with automatic defrost and a top-mounted freezer uses less than 500 kWh per year, whereas a typical model sold in 1973 used over 1,800 kWh per year.
- Federal efficiency standards first took effect in 1993, requiring new refrigerators and freezers to be more efficient than ever before. A new set of stricter standards took effect July 1, 2001. Full-sized products that exceed the federal standard by 10% or more qualify for the ENERGY STAR label. Compact refrigerators and freezers must exceed the standard by 20% to qualify for the ENERGY STAR label.
- Operating costs vary greatly due to:
  - Size (cubic foot capacity);
  - Type of defrost system (manual, partial, or automatic);
  - Style (top mount, bottom mount, or side by side for refrigerator/freezers; upright or chest for freezers);
  - Age (manufacture date).
- Efficiency of a refrigerator/freezer can be affected by:
  - Temperature control settings;
  - Location (temperature of room);
  - Maintenance (gaskets, condenser coils);
  - Number of times and duration of door openings;
  - Amount of food stored.

## Refrigerator/Freezer (continued)

### TYPES OF REFRIGERATOR/FREEZERS

- **Manual Defrost** – Frost must be removed manually from the refrigerator/freezer when it becomes one-quarter of an inch thick.\* This type of refrigerator/freezer generally has less than 15 cubic feet of capacity and has a single door. It is designed for storage of fresh food, but has a small compartment for freezing ice cubes and short-term storage of already-frozen food. Since it does not have a freezer section capable of reaching 0°F, it should not be used to store anything but ice cubes for any length of time. It cannot keep ice cream or other foods solidly frozen.

*\*To manually remove frost, turn setting to “off” or “defrost” to allow the frost to melt and loosen so that ice and water can be removed by hand.*

- **Partial Defrost** – Frost is removed automatically from the refrigerator section, but must be removed manually from the freezer section. A partial automatic defrost refrigerator/freezer usually has two doors with separate refrigerator and freezer sections.
- **Automatic Defrost** – Frost is removed automatically in both the refrigerator and freezer sections. A fan circulates cold air to help maintain a more uniform interior temperature. The automatic defrost refrigerator/freezer has two or more doors and the freezer section may be on the top, at the bottom, or along side the refrigerator section.

### TIPS FOR BUYING

- **Check the EnergyGuide label.** To properly compare the operating cost of one refrigerator with another, both units should have the same type of defrost system, features, overall cubic foot capacity, and freezer section capacity.
- **Consider that the efficiency of refrigerators and freezers has improved considerably.** New models have improved insulation, compressors, motors, door seals, and larger condenser coil surface areas. You should consider replacing your refrigerator if it is more than ten years old. New efficiency standards went into effect in 2001, and older units are typically two to three times more expensive to run than a new unit.
- **Evaluate the operating cost.** A fully automatic refrigerator/freezer will have a higher operating cost than a manually defrosted refrigerator.
- **Choose the right size model** for your needs. Too large a model will result in wasted space and energy. Too small a model leads to extra trips to the store. The most energy-efficient models have a capacity of 16-20 cubic feet. Generally, the larger the refrigerator, the greater the energy consumption.

## Refrigerator/Freezer (continued)

- **Look for the ENERGY STAR label on products.** Earning the ENERGY STAR means a product meets strict energy efficiency guidelines set by the Environmental Protection Agency and the U.S. Department of Energy. ENERGY STAR qualified units exceed federal standards by at least 10%.
- **Consider doing without an ice maker and ice dispenser.** Automatic ice makers and through-the-door dispensers increase energy use by 14%-20% and raise the purchase price by about \$75-\$250.
- **Look for a refrigerator with automatic moisture control.** Models with this feature have been engineered to prevent moisture accumulation on the cabinet exterior without the addition of a heater. This is not the same thing as an “anti-sweat” heater. Models with an anti-sweat heater consume 5%-10% more energy than models without this feature.
- **Consider chest freezers** (top loading). These are usually more efficient than upright (front loading) models. Air does not spill out when the door is opened. However, they may be more difficult to organize for easy access to frozen foods.
- **Evaluate your decision to own a second refrigerator/freezer.** Generally, if you choose to own a second refrigerator/freezer, it is a used or older model and will use more energy than the newer models. You may not realize it, but you may be paying more to use the second refrigerator/freezer than your new one. If you do decide to have a second refrigerator/freezer, keep it in good working condition and place it in a cool well-ventilated area.



### TIPS FOR USING

- **Locate refrigerators and freezers away from the range, dishwasher, water heater, and direct sunlight.** A refrigerator located in a warm area must work harder, thus increasing energy use.
- **Maintain the temperature between 37° and 40°F in the refrigerator section and 0°F in the freezer section.** To check refrigerator temperature, place an appliance thermometer in a glass of water in the center of the refrigerator. Read it after 24 hours. To check the freezer temperature, place thermometer between frozen packages and read it after 24 hours.
- **Unplug the refrigerator and clean its condenser coils,** especially if you have pets that shed, unless you have a no-clean condenser model. Your refrigerator will run for shorter periods with clean coils. Check your owner's manual for safety guidelines and the location of the coils.
- **Allow at least a one-inch space** on each side of the refrigerator/freezer so that air can circulate around the condenser coils. If air flow is blocked, energy performance will drop.

## Refrigerator/Freezer (continued)

- **Defrost** manual and partial defrost freezers when frost/ice becomes one-quarter-inch thick. A build-up of ice on the coil inside the unit makes the compressor run longer to maintain a cold temperature.
- **It's O.K. to place warm foods directly in the refrigerator**, but divide large quantities of food into shallow containers for quick cooling. Pre-cool hot soups and stews by immersing the container in ice water before placing it in the refrigerator. The USDA Food Safety and Inspection Service and the State of Hawaii Department of Health advise that bacteria that cause food borne illness grow at temperatures between 45°F and 140°F. Proper cooling limits the time and temperature at which harmful bacteria can grow.
- **Thaw frozen food in the refrigerator.** While thawing, it helps to keep the refrigerator cool.
- **Limit opening the refrigerator/freezer door** to only as often and as long as necessary.
- **Replace worn seals.** Leakage of cold air wastes energy and dollars. Test door seals by closing the door over a piece of paper or a dollar bill so it is half in and half out of the refrigerator. If you can pull the paper or bill out easily, the latch may need adjustment or the seal may need replacing.
- **Cover or seal all liquids and moist food** in the refrigerator/freezer to prevent them from drying out. Moisture from uncovered food can cause an automatic defrost refrigerator/freezer to use more energy.
- **Remove all heavy wrapping paper** before storing food. Paper acts as an insulator, prolonging the time it takes the food to cool.
- **Use the power-saver control**, if available, during periods of low humidity. (Hawaii's humid climate, however, requires that the power-saver control be "off" most or all of the time.) Turning off the power saver control allows heating strips around the door to come on to prevent moisture from condensing on the exterior of the refrigerator. Many of the older model refrigerator/freezers do not have a power saver control.
- **Fill your freezer to at least two-thirds of its capacity.** An empty freezer requires the same amount of energy, or more, to maintain 0°F.
- **Avoid overcrowding** items because too many items obstruct air circulation and reduce cooling capabilities.

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## Small Appliances

While some small appliances, such as coffeemakers, irons, hair dryers, and toasters, may appear to draw a large amount of power (1000 watts or more), they operate only a short period of time. Many of these appliances are thermostatically controlled, cycling on and off automatically, and do not add significantly to your electric bill.

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## Swimming Pool

### ENERGY USE

- Maintaining a swimming pool adds a considerable number of kilowatt-hours to your bill. A one-horsepower pump, running eight hours a day, uses about 240 kWh/month.
- A three-quarter-horsepower pool sweep, used for three hours a day, adds about 70 kWh/month.

### TIPS FOR USING

- **Check for proper sizing** of pump to pool size. Operate and maintain the pump properly.
- **Keep pool filters and strainers clean** to increase pump efficiency and reduce the number of running hours per month needed to keep your pool clean.
- **Place an insulator blanket over the water surface** if you have a heated pool that is not in use.
- **Use a heat pump water heater or a solar water heater** to heat the water.

## Televisions and Other Electronic Equipment

### ENERGY USE

- **Energy used by consumer electronics has more than doubled between 1990 and 2001** and it's projected to grow even more as new gadgets are introduced and the desire for convenience and entertainment increases.
- **Did you know that many household electronics continue to use power even when they are turned off?** Many home appliances and electronic devices consume small amounts of electricity even when they appear to be inactive or turned off. This is known as “phantom loads,” or “leaking electricity,” or “energy sneakers.”
  - You can see this for yourself by touching the wall adapter of your cordless phone or cellular phone re-charger—if it's warm, you know it's using power. Anything that requires an adapter uses a phantom load.
  - You can also spot phantom loads by observing light-emitting diode (LED) displays, such as the clock display on your microwave, VCR, or stereo. These electronic devices are using standby power to maintain signal reception capability, monitor conditions, power internal clocks, charge batteries, and display information.
  - Cable boxes for cable and satellite transmission use almost equal amounts of energy in active and standby modes.
  - With the explosion in the number of electronic devices in the home and office, the fastest growing portion of power consumption comes from the phantom load of electronic devices not in use.
  - In the average home, 75% of the electricity used to power home electronics is consumed while the products are turned off, but are in standby mode.

## Televisions and Other Electronic Equipment (continued)

Here's a chart that lists a sample of household appliances and electronics. You can see the typical energy use and energy cost of each item when it is "on" or active and when it is in standby mode.

| Description                           | POWER ON              |                    |                 | STANDBY                       |                          |                 |
|---------------------------------------|-----------------------|--------------------|-----------------|-------------------------------|--------------------------|-----------------|
|                                       | Watts Used While "On" | Hours "On" Per Day | Cost Per Month* | Watts Used While On "Standby" | Hours On Standby Per Day | Cost Per Month* |
| 32" LCD flat panel High Definition TV | 240                   | 6                  | \$6.48          | 22                            | 18                       | \$1.78          |
| 42" plasma High Definition TV         | 430                   | 6                  | \$11.61         | 1.5                           | 18                       | \$0.12          |
| 34" tube TV                           | 250                   | 6                  | \$6.75          | 23                            | 18                       | \$1.86          |
| DVD Player                            | 20                    | 6                  | \$0.54          | 4.5                           | 18                       | \$0.36          |
| CD Player                             | 16                    | 6                  | \$0.43          | 3.1                           | 18                       | \$0.25          |
| Receiver                              | 6.7                   | 6                  | \$0.18          | 1.8                           | 18                       | \$0.15          |
| Power speaker                         | 5.8                   | 6                  | \$0.16          | 4.6                           | 18                       | \$0.37          |
| Mini stereo system                    | 34                    | 6                  | \$0.92          | 9.4                           | 18                       | \$0.76          |
| Computer                              | 200                   | 6                  | \$5.40          | 2                             | 18                       | \$0.16          |
| Computer printer – color ink jet      | 25                    | 6                  | \$0.68          | 5.25                          | 18                       | \$0.43          |
| Phone/fax/copier combo                | 22                    | 1                  | \$0.10          | 4.7                           | 23                       | \$0.49          |
| Cordless phone                        | 3                     | 3                  | \$0.04          | 2.7                           | 21                       | \$0.26          |
| Cable box                             | 32                    | 6                  | \$0.86          | 25                            | 18                       | \$2.03          |
| Microwave oven                        | 1500                  | 0.25               | \$1.69          | 3                             | 23.75                    | \$0.32          |

\*Based on \$0.15 per kWh

## Televisions and Other Electronic Equipment (continued)

### TIPS FOR BUYING

Look for the ENERGY STAR label on TVs, DVDs, VCRs, TV/VCR and TV/DVD combination units, home audio equipment, cordless phones, and power adapters. Earning the ENERGY STAR means a product meets strict energy efficiency guidelines set by the Environmental Protection Agency and the U.S. Department of Energy.



Home electronic products use energy when they're off to power features like clock displays and remote controls. Those that have earned the ENERGY STAR use as much as 50% less energy to perform these functions while providing the same performance at the same price as less-efficient models.

- **ENERGY STAR qualified TVs use about 25% less energy than standard units.** When inactive or turned off, an ENERGY STAR qualified TV will go into deep sleep mode, consuming less than three watts of power, compared to 12 watts for conventional models. This saves 75% of energy normally consumed. You can find the ENERGY STAR on everything from standard TVs, to HD-ready TVs, to the largest flat-screen plasma TVs.
- **ENERGY STAR qualified DVD products use as little as one quarter of the energy used by standard models when inactive or turned off.** ENERGY STAR qualified DVD players come with all the latest features, including progressive scan.
- **ENERGY STAR qualified VCRs use about 30% less total energy than standard units.** When inactive or turned off, ENERGY STAR qualified VCRs consume no more than four watts of power.
- **ENERGY STAR qualified TV/VCR and TV/DVD combination units use about 30% less energy than standard units** and come with all the latest features, from progressive-scan DVD players to HD-ready TVs.
- **ENERGY STAR qualified cordless phones, answering machines, and combination units use about one-third of the energy used by conventional units.** These products use less energy by incorporating improved energy performance features such as switch-mode power supplies and "smart" chargers.

## Televisions and Other Electronic Equipment (continued)

- **ENERGY STAR qualified external power adapters are on average 35% more efficient than conventional models** and are often lighter and smaller in size, making it easier to transport products like laptops. External power adapters are also known as power supplies or battery chargers and they convert high-voltage AC electricity from the wall outlet to the low-voltage DC power used to power electronic products, like MP3 players, Personal Digital Assistants (PDAs), camcorders, digital cameras, laptops, and cordless and mobile phones.

**Look for the ENERGY STAR label on office equipment.** Office equipment that has earned the ENERGY STAR helps eliminate wasted energy through special power management features. When equipment is not in use, it automatically enters a low-power “sleep” mode. An ENERGY STAR qualified computer in sleep mode consumes about 80% less electricity than it does in full-power mode.



Overall, ENERGY STAR qualified office products use about half as much electricity as standard equipment. Spending a large portion of time in sleep and off modes not only saves energy, but also helps office equipment run cooler and last longer.

- **ENERGY STAR qualified computers use 70% less electricity than computers without enabled power management features.** New chip technologies make power management features more reliable, dependable, and user-friendly than even just a few years ago.
- **ENERGY STAR qualified computer monitors use up to 60% less electricity than standard models.**
- **ENERGY STAR qualified printers can cut the equipment's electricity use by over 60%.**
- **ENERGY STAR qualified multifunction devices (MFDs) (units that combine printing, scanning, and faxing all into one unit) can reduce energy costs associated with use by almost 40%.**
- **The most energy-efficient computers are laptop computers,** which use 10% or less power to operate than a regular PC and have low power use settings. Laptops are designed with liquid crystal displays (LCDs), and these consume far less energy than regular PC monitors comprised of cathode ray tubes (CRTs).
- **Consider purchasing a flat-screen monitor.** It uses significantly less energy and is not as hard on the eyes.

## Televisions and Other Electronic Equipment *(continued)*

### TIPS FOR USING

- **Turn off TV sets, electronics, and office equipment** when they are not being used. Contrary to popular belief, turning equipment on and off does not shorten the life span of computers or related equipment.
- **Reduce or eliminate phantom loads when possible** by unplugging the cell phone charger and other electronics when not in use. Better yet, plug electronic equipment into a power strip. This allows it to be effectively disconnected using the strip's on-and-off button. Follow manufacturers' recommendations to avoid overloading power strips. *Be sure to ask your cable and Internet service providers about power requirements before disconnecting cable box units.*
- **Limit computer screen-saver use.** A screen saver does not save energy. In fact, more often than not, a screen saver not only will draw power for the monitor, but also will keep the CPU from shutting down. You can set your computer to go from screen-saver to sleep mode.

## Water Heater

### ENERGY USE

In Hawaii, the largest portion of monthly energy use in homes without air conditioning usually comes from the use of conventional electric water heaters.

Conventional electric water heaters use an estimated 240 to 400 kWh/month.\* Energy use may fluctuate depending on family size and use of hot water.

Heat pump water heaters can reduce water heating costs by approximately 30 to 40%. The estimated energy use for a heat pump water heater is 140 to 280 kWh/month.\*

Solar water heaters that are well-designed and properly sized can reduce water heating costs by 80 to 90%. The estimated energy use, for a solar water heater, is 20 to 80 kWh/month.\* Savings may be higher or lower depending on: number, size, and placement of the solar panel; weather conditions; and hot water consumption.

\* *Estimated energy use calculations are based on a family of four.*

### TYPES OF WATER HEATERS

- **Conventional** – A conventional, electric water heater contains an electric heating element that heats the water in the storage tank. The heating element is controlled by a thermostat. When the water in the storage tank reaches the thermostat's preset temperature, the heating element turns off. Because some heat is constantly being lost through the walls of the storage tank, the heating element must periodically turn on to maintain the temperature. The amount of heat loss is determined by the heater's efficiency factor (EF). The higher the EF rating the lower the heat loss.
- **Heat Pump** – A heat pump water heater works the same way as an air conditioner. It takes heat out of the outside air, but instead of throwing the heat away outside, it pumps it into the hot water tank. It works day or night in cloudy or sunny weather. A heat pump can be purchased mounted on its own water tank or purchased separately and connected to your present tank.

## Water Heater (continued)

- **Solar** – A solar water heater uses the sun’s energy to heat water. Solar water heaters cost more to purchase, but the operating cost is lower because the sun’s energy provides most of the heat. Electricity may be used to operate pumps and to provide backup heat during long periods of cloudy weather.
- **Tankless (on demand)** – An on-demand water heater produces hot water only when you need it, thereby eliminating the need for a water storage tank and freeing up some space in a home or garage. Tankless heaters can also provide limited energy savings by eliminating heat losses from the water storage tank. However, they have a low flow rate and may not be ideal for large families. Tankless models also require high operating current and may require you to upgrade electrical service, as well as install heavier gauge wiring and larger circuit breakers, especially if you live in an older home.

### TIPS FOR BUYING WATER HEATERS

- **Decide whether to purchase a high-efficiency electric water heater, heat pump, or solar water heater** depending on your family’s hot water requirements and the cost effectiveness of the system.
- **Do a life cycle cost analysis** to help make a wise purchasing decision when deciding which type and model of water heater to buy (see page 2).
- **Check on Hawaiian Electric Company’s *Energy\$olutions for the Home Program*** to see which water heaters qualify for energy-efficient technology rebates. Call 94-POWER (947-6937) or visit [www.heco.com](http://www.heco.com) and click on Residential Services, then *Energy\$olutions*<sup>SM</sup>.

### FOR ELECTRIC WATER HEATERS

- **Check the EnergyGuide label for the energy efficiency.** The energy efficiency of a water heater is indicated by its Energy Factor (EF), an overall efficiency rating based on 64 gallons of hot water use per day. The EF is an indication of a heater’s ability to retain heat. Generally, the smaller the tank the higher the EF and the more efficient the heater. Small tanks lose less heat due to their smaller surface area.
- **Select the right tank size.** If the tank is too large, energy will be wasted by keeping the extra water hot. If it is too small, hot water may run out. Select the tank size keeping in mind the type of water heater being purchased and the size of your family. Ask the salesperson for assistance in properly sizing your tank. As a rule of thumb, a family of four or five needs a 40 gallon “quick recovery” conventional water heater with two 4500-watt heating elements.

## Water Heater (continued)

- **Check the EnergyGuide label for the “first hour rating.”** A water heater should provide enough hot water during the period of the day when hot water requirements are high. The “first hour rating” indicates the ability of the water heater to meet peak demand. This rating shows how much hot water a heater can provide in one hour, starting with a full tank of cold water.
- **Remember that new water heaters are often more energy efficient.** If your water heater is more than ten years old, it probably has no higher than 80% efficiency. An old water heater can operate for years at very low efficiencies before it finally fails. One way to reduce water-heating costs is to replace your old water heater with a new, higher efficiency model. New energy-efficient water heaters have thick insulation, better heating element placement, and other energy-saving features that make them less expensive to operate than older models.

### TIPS FOR USING WATER HEATERS

- **Repair leaking faucets.** A drop each second can waste about 2000 gallons of water a year. A leaking hot water faucet wastes both water and up to 400 kWh per year.
- **Repair hot water leaks** – Hot water leaks are a frequent cause of extreme increases in energy costs. Hot water leaks have been known to increase monthly energy use by as much as 200%. Common symptoms of hot water leaks include: increased water consumption (the water meter is running even though no water is being used); warm water running from the cold water tap; warm or hot water spots in the floor; or a shortage of hot water. See the Board of Water Supply’s website (<http://www.hbws.org/cssweb/display.cfm?sid=1091>) for tips on detecting leaks.
- **Wrap older water heaters** with an insulation blanket. Adding insulation to heaters manufactured before 1980 helps to conserve energy. Insulation kits or blankets are available at hardware and building supply stores. To further reduce heat loss, insulate both water pipes leading out from the hot water tank.
- **Install modern flow restrictors** in older faucets and showerheads. Flow restrictors will reduce water flow by one to three gallons per minute.
- **Install low-flow shower heads and faucet aerators** to reduce water consumption and provide cost savings. Older shower heads allow water to flow at about six gallons per minute. Because showers use 37% of the hot water in typical U.S. homes, all shower heads sold in the United States must meet the federal efficiency standard of using at most two

## Water Heater (continued)

and a half gallons per minute. There are shower heads that use only one and a half gallons per minute. Many new shower heads meet this standard with an increase in performance; this will be particularly noticeable to owners of older homes with poor water pressure. Good low-flow shower heads maintain high pressure by mixing air and water, giving an effective and pleasant shower.

- **Lower the setting** on your heater to 120°F or less,\* unless you have a dishwasher without a booster heater. Reducing the water heater's thermostat setting saves energy by reducing heat loss through the insulated jacket wall.

*\* To adjust the setting on your water heater, turn off the electricity to the water heater at the circuit breaker panel. Remove the thermostat(s) access panel(s) and push the insulation aside with a screwdriver. Most heaters have two thermostats to adjust: one for the upper heating element and one for the lower heating element. Use the screwdriver to turn the indicator to the desired temperature. Replace the insulation and access panel(s). Turn the electricity back on at the circuit breaker panel.*

- **Take short five-minute showers** instead of tub baths. Filling the bathtub full of water may take over 25 gallons of hot water.
- **Cover or close the drain** and fill the basin or sink, rather than let water run while shaving or doing dishes by hand.
- **Place new water heaters near the area of greatest use** so heat will not be lost in long pipe runs.
- **Installing a timer may or may not result in savings.** Most of the heater's operating cost goes toward heating cold water; once heated, only 10 to 15% is used to maintain the temperature. The heating element comes on for less than half an hour a day to maintain the temperature. Savings may be largely offset by having to reheat water that has partially cooled. Only if a timer helps you reduce your hot water consumption, will savings result. If you are not using much hot water now, a timer may not be for you. Families will save if they set the timer on their heater to be on for only a short period each day and do with less hot water the rest of the time.
- **Turn the water heater circuit breaker off** if no one will be home for more than two days in a row.\*\*

*\*\* Using the circuit breaker daily to turn the heater on and off may shorten its life. The circuit breaker is a safety device designed to automatically cut off the electricity in case of a short circuit or overload. The circuit breaker is a valuable protective device, but it is not designed to be switched on and off daily.*

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## Energy Use Guide

The first step in managing your electrical consumption is knowing how much electricity it takes to operate your appliances—which ones are the major energy users, which ones increase consumption only minimally, and which ones may be inefficient because of their age.

The following tables provide estimates on the energy use for different appliances, electrical equipment and hot water usage. The energy use, measured in kilowatt-hours (kWh), is calculated using estimated wattage for the appliance listed and the estimated frequency of use for a family of four.

Remember to use these as a **guideline** only, as the actual wattage varies for different brands of appliances, and frequency of use may differ due to your lifestyle and family size.

| Item   | Energy Efficiency Ratio | Typical Wattage | Unit of Use  | kWh per Use | Cost per Use*    | kWh per Month | Cost per Month* |
|--|-------------------------|-----------------|--------------|-------------|------------------|---------------|-----------------|
| <b>Air Conditioners—</b>   |                         |                 |              |             |                  |               |                 |
| <b>Room and small split-systems</b>                                  |                         |                 |              |             |                  |               |                 |
| 5000 Btu/H   | EER 10.7                | 470             | 4 hr/day     | 1.88        | \$0.28           | 56.40         | \$8.46*         |
| 8000 Btu/H   | EER 10.8                | 740             | 4 hr/day     | 2.96        | \$0.44           | 88.80         | \$13.32*        |
| 10000 Btu/H  | EER 10.0                | 1000            | 4 hr/day     | 4.00        | \$0.60           | 120.00        | \$18.00*        |
| 12000 Btu/H (1 TON)  | EER 11.0                | 1090            | 4 hr/day     | 4.36        | \$0.65           | 130.80        | \$19.62*        |
| 18000 Btu/H (1.5 TON)  | EER 9.7                 | 1855            | 4 hr/day     | 7.42        | \$1.11           | 222.60        | \$33.39*        |
| 24000 Btu/H (2 TON)  | EER 9.5                 | 2525            | 4 hr/day     | 10.10       | \$1.52           | 303.00        | \$45.45*        |
| <b>Portable</b>  |                         |                 |              |             |                  |               |                 |
| 7500 Btu/H   | EER 7.5                 | 1000            | 8 hr/day     | 8.00        | \$1.20           | 240.00        | \$36.00*        |
| 9000 Btu/H   | EER 8.18                | 1120            | 8 hr/day     | 8.96        | \$1.34           | 268.80        | \$40.32*        |
| 10000 Btu/H  | EER 15                  | 660             | 8 hr/day     | 5.28        | \$0.79           | 158.40        | \$23.76*        |
| 12000 Btu/H  | EER 9.5                 | 1350            | 8 hr/day     | 10.80       | \$1.62           | 324.00        | \$48.60*        |
| 14000 Btu/H  | EER 9.1                 | 1540            | 8 hr/day     | 12.32       | \$1.85           | 369.60        | \$55.44*        |
| <b>Central and large split-systems</b>                               |                         |                 |              |             |                  |               |                 |
| 24000 Btu/H (2 TON)  | SEER 12.0               | 2330            | 8 hr/day     | 18.64       | \$2.80           | 559.20        | \$83.88*        |
| 36000 Btu/H (3 TON)  | SEER 12.0               | 3400            | 8 hr/day     | 27.20       | \$4.08           | 816.00        | \$122.40*       |
| 48000 Btu/H (4 TON)  | SEER 13.0               | 4320            | 8 hr/day     | 34.56       | \$5.18           | 1036.80       | \$155.52*       |
| 60000 Btu/H (5 TON)  | SEER 12.0               | 5825            | 8 hr/day     | 46.60       | \$6.99           | 1398.00       | \$209.70*       |
| <b>Aquarium, Filter (10 gal) Pump</b>                                |                         | 5               | 24 hr/day    | 0.12        | \$0.02           | 3.60          | \$0.54          |
| <b>Blanket (electric)</b>  |                         | 175             | 6 hr/day     | 0.53        | \$0.08           | 15.75         | \$2.36+         |
| <b>Blender</b>   |                         | 500             | 2 min/day    | 0.02        | less than \$0.01 | 0.50          | \$0.08          |
| <b>Bottle Warmer</b>   |                         | 400             | 10 min/day   | 0.06        | \$0.01           | 1.80          | \$0.27+         |
| <b>Broiler Oven</b>  |                         | 1500            | 15 min/week  | 0.38        | \$0.06           | 1.50          | \$0.23          |
| <b>Cable Box Converter—see Electronics-Video-Cable Box Converter</b> |                         |                 |              |             |                  |               |                 |
| <b>Can Opener</b>  |                         | 100             | 1 min/day    | 0.0017      | less than \$0.01 | 0.05          | \$0.01          |
| <b>Carpet Cleaner</b>  |                         | 1200            | 1 hr/month   | 1.20        | \$0.18           | 1.20          | \$0.18          |
| <b>Carving Knife</b>   |                         | 100             | 30 min/month | 0.05        | less than \$0.01 | 0.05          | \$0.01          |
| <b>Cassette Player</b>   |                         | 20              | 2 hr/day     | 0.04        | \$0.01           | 1.20          | \$0.18          |
| <b>Clock</b>   |                         | 2               | 24 hr/day    | 0.05        | \$0.01           | 1.44          | \$0.22          |

\* Compressor "on" the entire time.

+ Thermostatically controlled appliance. Figures based on industry estimated "on" time.

\* Based on \$0.15 per kWh.

| Item   | Typical Wattage | Unit of Use | kWh per Use | Cost per Use*    | kWh per Month | Cost per Month*     |
|--|-----------------|-------------|-------------|------------------|---------------|---------------------|
| <b>Clothes Dryer</b>   | 5000            | 40 min/load | 2.5 – 3.0   | \$0.38 – \$0.45  | 80.0 – 96.0   | \$12.00 – \$14.40+  |
| <b>Clothes Washer</b><br>(Excluding Hot Water)                         | 500             | 1 load      | 0.33        | \$0.05           | 10.67         | \$1.60 <sup>^</sup> |
| <b>Coffee Maker, Auto Drip</b><br>(Brew Cycle)                         | 1250            | 8 min/day   | 0.17        | \$0.03           | 5.00          | \$0.75              |
| <b>Coffee Maker, Auto Drip</b><br>(Warm Cycle)                         | 70              | 2 hr/day    | 0.14        | \$0.02           | 4.20          | \$0.63              |
| <b>Coffee Maker, Auto Perc</b><br>5-12 cup                             | 600             | 8 min/day   | 0.08        | \$0.01           | 2.40          | \$0.36              |
| <b>Coffee Maker, Auto Perc</b><br>(Warm Cycle)                         | 80              | 2 hr/day    | 0.16        | \$0.02           | 4.80          | \$0.72              |
| <b>Coffee Maker, Auto Perc</b><br>12-36 cup                            | 1000            | 8 min/day   | 0.13        | \$0.02           | 4.00          | \$0.60              |
| <b>Coffee Maker, Auto Perc</b><br>25-100 cup                           | 1500            | 8 min/day   | 0.20        | \$0.03           | 6.00          | \$0.90              |
| <b>Compact Disc Player</b> – see <i>Electronics-Audio-Compact Disc</i> |                 |             |             |                  |               |                     |
| <b>Computer</b> – see <i>Electronics-Computer</i>                      |                 |             |             |                  |               |                     |
| <b>Convection Oven</b>   | 1500            | 15 min/week | 0.38        | \$0.06           | 1.50          | \$0.23              |
| <b>Curling Iron</b>  | 40              | 20 min/day  | 0.01        | less than \$0.01 | 0.30          | \$0.05+             |
| <b>Deep Fat Fryer</b>  | 1250            | 4 hr/month  | 2.50        | \$0.38           | 2.50          | \$0.38+             |
| <b>Dehumidifier</b>  | 785             | 24 hr/day   | 18.84       | \$2.83           | 565.20        | \$84.78             |
| <b>Dishwasher</b><br>(Excluding Hot Water)                             | 1200            | 1 load/day  | 0.66 – 1.00 | \$0.10 – \$0.15  | 20.0 – 30.0   | \$3.00 – \$4.50     |
| <b>DVD Player</b> – see <i>Electronics-Video-DVD Player</i>            |                 |             |             |                  |               |                     |
| <b>Egg Cooker</b>  | 500             | 15 min/week | 0.13        | \$0.02           | 0.50          | \$0.08              |
| <b>Electronics – Audio-Amplifier</b> (On mode)                         | 31              | 2 hr/day    | 0.06        | \$0.01           | 1.86          | \$0.28              |
| <b>Audio-Amplifier</b> (Standby mode)                                  | 1.4             | 22 hr/day   | 0.03        | less than \$0.01 | 0.92          | \$0.14              |
| <b>Audio-Boom Box</b> (On mode)  | 4.8             | 2 hr/day    | 0.01        | less than \$0.01 | 0.29          | \$0.04              |
| <b>Audio-Boom-Box</b> (Standby mode)                                   | 2.2             | 22 hr/day   | 0.05        | \$0.01           | 1.45          | \$0.22              |
| <b>Audio-Compact Disc Player</b> (On mode)                             | 20              | 2 hr/day    | 0.04        | \$0.01           | 1.20          | \$0.18              |

<sup>^</sup> See section on clothes washers – assumes ½ kWh per load.

+ Thermostatically controlled appliance. Figures based on industry estimated “on” time.

\* Based on \$0.15 per kWh.

| Item   | Typical Wattage | Unit of Use         | kWh per Use | Cost per Use*    | kWh per Month | Cost per Month* |
|--|-----------------|---------------------|-------------|------------------|---------------|-----------------|
| <b>Electronics – (Continued)</b>                                 |                 |                     |             |                  |               |                 |
| <b>Audio-Compact Disc Player</b> (Standby mode)                  | 3.1             | 22 hr/day           | 0.07        | \$0.01           | 2.05          | \$0.31          |
| <b>Audio-Mini Stereo System</b> (On mode)                        | 34              | 2 hr/day            | 0.07        | \$0.01           | 2.04          | \$0.31          |
| <b>Audio-Mini Stereo System</b> (Standby mode)                   | 9.4             | 22 hr/day           | 0.21        | \$0.03           | 6.20          | \$0.93          |
| <b>Audio-Power Speaker</b> (On mode)                             | 5.8             | 2 hr/day            | 0.01        | less than \$0.01 | 0.35          | \$0.05          |
| <b>Audio-Power Speaker</b> (Standby mode)                        | 4.6             | 22 hr/day           | 0.10        | \$0.02           | 3.04          | \$0.46          |
| <b>Audio-Receiver</b> (On mode)                                  | 6.7             | 2 hr/day            | 0.01        | less than \$0.01 | 0.40          | \$0.06          |
| <b>Audio-Receiver</b> (Standby mode)                             | 1.8             | 22 hr/day           | 0.04        | \$0.01           | 1.19          | \$0.18          |
| <b>Audio-Tuner</b> (On mode)                                     | 6.2             | 2 hr/day            | 0.01        | less than \$0.01 | 0.37          | \$0.06          |
| <b>Audio-Tuner</b> (Standby mode)                                | 2               | 22 hr/day           | 0.04        | \$0.01           | 1.32          | \$0.20          |
| <b>Computer Monitor-15-inch LCD Flat Panel</b>                   | 22              | 2 hr/day            | 0.04        | \$0.01           | 1.32          | \$0.20          |
| <b>Computer Monitor-15-inch LCD Flat Panel</b>                   | 26              | 2 hr/day            | 0.05        | \$0.01           | 1.56          | \$0.23          |
| <b>Computer Monitor-17-inch CRT Flat Monitor</b>                 | 90              | 2 hr/day            | 0.18        | \$0.03           | 5.40          | \$0.81          |
| <b>Computer Monitor-17-inch LCD Flat Panel</b>                   | 65              | 2 hr/day            | 0.13        | \$0.02           | 3.90          | \$0.59          |
| <b>Computer Monitor-20-inch LCD Flat Panel</b>                   | 75              | 2 hr/day            | 0.15        | \$0.02           | 4.50          | \$0.68          |
| <b>Computer (Desktop) &amp; Monitor</b> (On mode)                | 200             | 2 hr/day            | 0.40        | \$0.06           | 12.00         | \$1.80          |
| <b>Computer (Desktop) &amp; Monitor</b> (Standby mode)           | 2               | 22 hr/day           | 0.04        | \$0.01           | 1.32          | \$0.20          |
| <b>Computer (Laptop)</b>   | 15              | 2 hr/day            | 0.03        | less than \$0.01 | 0.90          | \$0.14          |
| <b>Computer Printer – Black &amp; White Laser Jet</b> (Printing) | 250             | 15 min/day          | 0.06        | \$0.01           | 1.88          | \$0.28          |
| <b>Computer Printer – B&amp;W Laser Jet</b> (Standby mode)       | 2               | 23 hr<br>45 min/day | 0.05        | \$0.01           | 1.43          | \$0.21          |
| <b>Computer Printer – Color Laser Jet</b> (Printing)             | 190             | 15 min/day          | 0.05        | \$0.01           | 1.43          | \$0.21          |

\* Based on \$0.15 per kWh.

| Item   | Typical Wattage | Unit of Use          | kWh per Use | Cost per Use*    | kWh per Month | Cost per Month*  |
|--|-----------------|----------------------|-------------|------------------|---------------|------------------|
| <b>Electronics – (Continued)</b>                           |                 |                      |             |                  |               |                  |
| <b>Computer Printer – Color Laser Jet (Standby mode)</b>   | 13              | 23 hr<br>45 min/day  | 0.31        | \$0.05           | 9.26          | \$1.39           |
| <b>Computer Printer – Color Ink Jet (Printing)</b>         | 25              | 15 min/day           | 0.01        | less than \$0.01 | 0.19          | \$0.03           |
| <b>Computer Printer – Color Ink Jet (Standby mode)</b>     | 5.25            | 23 hr<br>45 min/day  | 0.12        | \$0.02           | 3.74          | \$0.56           |
| <b>Computer Printer – Color Photo (Printing)</b>           | 20              | 30 min/month         | 0.01        | less than \$0.01 | 0.01          | less than \$0.01 |
| <b>Computer Printer – Color Photo (Standby mode)</b>       | 6               | 1 hr<br>30 min/month | 0.01        | less than \$0.01 | 0.01          | less than \$0.01 |
| <b>Computer Printer – Color Photo (Off mode)</b>           | 6               | 22 hr/month          | 0.13        | \$0.02           | 0.13          | 0.04             |
| <b>Computer Printer – Dot Matrix</b>                       | 50              | 15 min/day           | 0.01        | less than \$0.01 | 0.38          | \$0.06           |
| <b>Video-Cable Box Converter (Analog) (On mode)</b>        | 17.3            | 6 hr/day             | 0.10        | \$0.02           | 3.11          | \$0.47           |
| <b>Video-Cable Box Converter (Analog) (Standby mode)</b>   | 16.5            | 18 hr/day            | 0.30        | \$0.04           | 8.91          | \$1.34           |
| <b>Video-Cable Box Converter (Digital) (On mode)</b>       | 32              | 6 hr/day             | 0.19        | \$0.03           | 5.76          | \$0.86           |
| <b>Video-Cable Box Converter (Digital) (Stand-by mode)</b> | 25              | 18 hr/day            | 0.45        | \$0.07           | 13.50         | \$2.03           |
| <b>Video-DVD Player (On mode)</b>                          | 20              | 2 hr/day             | 0.04        | \$0.01           | 1.20          | \$0.18           |
| <b>Video-DVD Player (Standby mode)</b>                     | 4.5             | 22hr/day             | 0.10        | \$0.01           | 2.97          | \$0.45           |
| <b>Video-Game Console, 32 bit</b>                          | 72              | 2 hr/day             | 0.14        | \$0.02           | 4.32          | \$0.65           |
| <b>Video-Multimedia Projector (On mode)</b>                | 250             | 6 hr/day             | 1.50        | \$0.23           | 45.00         | \$6.75           |
| <b>Video-Multimedia Projector (On mode)</b>                | 195             | 6 hr/day             | 1.17        | \$0.18           | 35.10         | \$5.27           |
| <b>Video-Multimedia Projector (On mode)</b>                | 205             | 6 hr/day             | 1.23        | \$0.18           | 36.90         | \$5.54           |
| <b>Video-Multimedia Projector (Standby)</b>                | 5               | 18 hr/day            | 0.09        | \$0.01           | 2.70          | \$0.41           |
| <b>Video-Multimedia Projector (On mode)</b>                | 195             | 6 hr/day             | 1.17        | \$0.18           | 35.10         | \$5.27           |
| <b>Video-Multimedia Projector (Standby)</b>                | 4               | 18 hr/day            | 0.07        | \$0.01           | 2.16          | \$0.32           |

\* Based on \$0.15 per kWh.

| Item  | Typical Wattage | Unit of Use | kWh per Use | Cost per Use*    | kWh per Month | Cost per Month* |
|---|-----------------|-------------|-------------|------------------|---------------|-----------------|
| <b>Electronics – (Continued)</b>                                      |                 |             |             |                  |               |                 |
| <b>Video-Multimedia Projector (On mode)</b>                           | 195             | 6 hr/day    | 1.17        | \$0.18           | 35.10         | \$5.27          |
| <b>Video-Multimedia Projector (Standby)</b>                           | 4               | 18 hr/day   | 0.07        | \$0.01           | 2.16          | \$0.32          |
| <b>Video-Multimedia Projector (On mode)</b>                           | 280             | 6 hr/day    | 1.68        | \$0.25           | 50.40         | \$7.56          |
| <b>Video-Multimedia Projector (Standby)</b>                           | 5               | 18 hr/day   | 0.09        | \$0.01           | 2.70          | \$0.41          |
| <b>Video-Multimedia Projector (On mode)</b>                           | 240             | 6 hr/day    | 1.44        | \$0.22           | 43.20         | \$6.48          |
| <b>Video-Multimedia Projector (Standby)</b>                           | 4               | 18 hr/day   | 0.07        | \$0.01           | 2.16          | \$0.32          |
| <b>Video-Multimedia Projector (On mode)</b>                           | 195–280         | 6 hr/day    | 1.17–1.68   | \$0.18–\$0.25    | 35.10–50.40   | \$5.27–\$7.56   |
| <b>Video-Multimedia Projector (Standby)</b>                           | 4               | 18 hr/day   | 0.07        | \$0.01           | 2.16          | \$0.32          |
| <b>Video-TV-13-inch Tube-type Color TV (On mode)</b>                  | 100             | 6 hr/day    | 0.60        | \$0.09           | 18.00         | \$2.70          |
| <b>Video-TV-13-inch Tube-type Color TV (Standby mode)</b>             | 1               | 18 hr/day   | 0.02        | less than \$0.01 | 0.54          | \$0.08          |
| <b>Video-TV-24-inch Tube-type Color TV (On mode)</b>                  | 165             | 6 hr/day    | 0.99        | \$0.15           | 29.70         | \$4.46          |
| <b>Video-TV-24-inch Tube-type Color TV (Standby mode)</b>             | 1               | 18 hr/day   | 0.02        | less than \$0.01 | 0.54          | \$0.08          |
| <b>Video-TV-27-inch Tube-type Color TV (On mode)</b>                  | 180             | 6 hr/day    | 1.08        | \$0.16           | 32.40         | \$4.86          |
| <b>Video-TV-27-inch Tube-type Color TV (Standby mode)</b>             | 1               | 18 hr/day   | 0.02        | less than \$0.01 | 0.54          | \$0.08          |
| <b>Video-TV-30-inch Tube-type Color TV (On mode)</b>                  | 220             | 6 hr/day    | 1.32        | \$0.20           | 39.60         | \$5.94          |
| <b>Video-TV-30-inch Tube-type Color TV (Standby mode)</b>             | 3               | 18 hr/day   | 0.05        | \$0.01           | 1.62          | \$0.24          |
| <b>Video-TV-32-inch LCD Flat Panel High Definition (On mode)</b>      | 240             | 6 hr/day    | 1.44        | \$0.22           | 43.20         | \$6.48          |
| <b>Video-TV-32-inch LCD Flat Panel High Definition (Standby mode)</b> | 22              | 18 hr/day   | 0.40        | \$0.06           | 11.88         | \$1.78          |
| <b>Video-TV-34-inch Tube-type Color TV (On mode)</b>                  | 250             | 6 hr/day    | 1.50        | \$0.23           | 45.00         | \$6.75          |
| <b>Video-TV-34-inch Tube-type Color TV (Standby mode)</b>             | 3               | 18 hr/day   | 0.05        | \$0.01           | 1.62          | \$0.24          |

\* Based on \$0.15 per kWh.

| Item  | Typical Wattage | Unit of Use | kWh per Use | Cost per Use*    | kWh per Month | Cost per Month* |
|---|-----------------|-------------|-------------|------------------|---------------|-----------------|
| <b>Electronics – (Continued)</b>                                      |                 |             |             |                  |               |                 |
| <b>Video-TV-42-inch Plasma High Definition (On mode)</b>              | 430             | 6 hr/day    | 2.58        | \$0.39           | 77.40         | \$11.61         |
| <b>Video-TV-42-inch Plasma High Definition (Standby mode)</b>         | 1.5             | 18 hr/day   | 0.03        | less than \$0.01 | 0.81          | \$0.12          |
| <b>Video-TV-50-inch Plasma High Definition (On mode)</b>              | 520             | 6 hr/day    | 3.12        | \$0.47           | 93.60         | \$14.04         |
| <b>Video-TV-50-inch Plasma High Definition (Standby mode)</b>         | 1.5             | 18 hr/day   | 0.03        | less than \$0.01 | 0.81          | \$0.12          |
| <b>Video-TV-57-inch High Definition CRT Projection (On mode)</b>      | 260             | 6 hr/day    | 1.56        | \$0.23           | 46.80         | \$7.02          |
| <b>Video-TV-57-inch High Definition CRT Projection (Standby mode)</b> | 1               | 18 hr/day   | 0.02        | less than \$0.01 | 0.54          | \$0.08          |
| <b>Video-VCR (On mode)</b>  | 12              | 2 hr/day    | 0.02        | less than \$0.01 | 0.72          | \$0.11          |
| <b>Video-VCR (Standby mode)</b>                                       | 5.6             | 22 hr/day   | 0.12        | \$0.02           | 3.70          | \$0.55          |
| <b>Fan, Bathroom Exhaust Ceiling</b>                                  | 90              | 4 hr/day    | 0.36        | \$0.05           | 10.80         | \$1.62          |
| <b>Kitchen Exhaust Oscillating</b>                                    | 100             | 4 hr/day    | 0.40        | \$0.06           | 12.00         | \$1.80          |
| <b>Kitchen Exhaust Polisher/Cleaner</b>                               | 275             | 1 hr/day    | 0.28        | \$0.04           | 8.25          | \$1.24          |
| <b>Oscillating</b>  | 100             | 4 hr/day    | 0.40        | \$0.06           | 12.00         | \$1.80          |
| <b>Polisher/Cleaner</b>   | 350             | 1 hr/month  | 0.35        | \$0.05           | 0.35          | \$0.05          |
| <b>Fondue Pot</b>   | 750             | 2 hr/month  | 0.75        | \$0.11           | 0.75          | \$0.11+         |
| <b>Food Processor</b>   | 750             | 20 min/week | 0.25        | \$0.04           | 1.00          | \$0.15          |
| <b>Frying Pan/Skillet</b>   | 1250            | 15 min/week | 0.21        | \$0.03           | 0.83          | \$0.13+         |
| <b>Garage Door Opener</b>   | 350             | 3 min/day   | 0.02        | less than \$0.01 | 0.53          | \$0.08          |
| <b>Garbage Disposer</b>   | 500             | 2 min/day   | 0.02        | less than \$0.01 | 0.50          | \$0.08          |
| <b>Garden Tools, Edger</b>  | 650             | 1 hr/month  | 0.65        | \$0.10           | 0.65          | \$0.10          |
| <b>Garden Tools, Hedge Trimmer</b>                                    | 300             | 1 hr/month  | 0.30        | \$0.05           | 0.30          | \$0.05          |
| <b>Garden Tools, Hedge Weeder</b>                                     | 440             | 1 hr/month  | 0.44        | \$0.07           | 0.44          | \$0.07          |
| <b>Garden Tools, Lawn Mower</b>                                       | 1200            | 2 hr/month  | 2.40        | \$0.36           | 2.40          | \$0.36          |
| <b>Griddle</b>  | 1350            | 2 hr/month  | 2.03        | \$0.30           | 2.03          | \$0.30+         |
| <b>Hair Blow Dryer</b>  | 1800            | 20 min/day  | 0.60        | \$0.09           | 18.00         | \$2.70          |
| <b>Hair Dryer (Hood)</b>  | 1200            | 5 hr/month  | 6.00        | \$0.90           | 6.00          | \$0.90          |
| <b>Hair Dryer (Soft Bonnet)</b>                                       | 400             | 5 hr/month  | 2.00        | \$0.30           | 2.00          | \$0.30          |

+ Thermostatically controlled appliance. Figures based on industry estimated "on" time.

\* Based on \$0.15 per kWh.

| Item  | Typical Wattage | Unit of Use  | kWh per Use | Cost per Use <sup>+</sup> | kWh per Month | Cost per Month <sup>+</sup> |
|---|-----------------|--------------|-------------|---------------------------|---------------|-----------------------------|
| Hair Rollers                                | 400             | 10 min/day   | 0.05        | \$0.01                    | 1.60          | \$0.24+                     |
| Heating Pad                                 | 50              | 1 hr/month   | 0.03        | less than \$0.01          | 0.03          | \$0.0049+                   |
| Hot Plate                                   | 1200            | 15 min/day   | 0.24        | \$0.04                    | 7.20          | \$1.08+                     |
| Hot Tub/Spa                                 | 5000            | 24 hr/day    | 13.33       | \$2.00                    | 400.00        | \$60.00 <sup>B</sup>        |
| Ice Crusher                                 | 200             | 1 min/day    | 0.0033      | less than \$0.01          | 0.10          | \$0.02                      |
| Iron  | 1000            | 30 min/week  | 0.25        | \$0.04                    | 1.00          | \$0.15+                     |
| Kiln  | 1500            | 10 hr/firing | 7.50        | \$1.13                    | 7.50          | \$1.13+                     |
| Kiln  | 3500            | 10 hr/firing | 17.50       | \$2.63                    | 17.50         | \$2.63+                     |
| Kiln  | 8000            | 10 hr/firing | 40.00       | \$6.00                    | 40.00         | \$6.00+                     |
| Lighting, Christmas, LED-35 Lamp String     | 1.8             | 5 hr/day     | 0.01        | less than \$0.01          | 0.27          | \$0.04                      |
| LED-70 Lamp String                          | 3.6             | 5 hr/day     | 0.02        | less than \$0.01          | 0.54          | \$0.08                      |
| LED-100 Lamp String                         | 3.6             | 5 hr/day     | 0.02        | less than \$0.01          | 0.54          | \$0.08                      |
| Midget-100 Lamp String                      | 10              | 5 hr/day     | 0.05        | \$0.01                    | 1.50          | \$0.23                      |
| Miniature-20 Lamp String                    | 20              | 5 hr/day     | 0.10        | \$0.02                    | 3.00          | \$0.45                      |
| Regular-15 Lamp String                      | 100             | 5 hr/day     | 0.50        | \$0.08                    | 15.00         | \$2.25                      |
| Outdoor-15 Lamp String                      | 150             | 5 hr/day     | 0.75        | \$0.11                    | 22.50         | \$3.38                      |
| Lighting, Household, Incandescent, Standard | 40              | 3 hr/day     | 0.12        | \$0.02                    | 3.60          | \$0.54                      |
| Incandescent, Standard                      | 60              | 3 hr/day     | 0.18        | \$0.03                    | 5.40          | \$0.81                      |
| Incandescent, Standard                      | 75              | 3 hr/day     | 0.23        | \$0.03                    | 6.75          | \$1.01                      |
| Incandescent, Standard                      | 100             | 3 hr/day     | 0.30        | \$0.05                    | 9.00          | \$1.35                      |
| Incandescent, Standard                      | 150             | 3 hr/day     | 0.45        | \$0.07                    | 13.50         | \$2.03                      |
| Incandescent, Energy-Saving                 | 34              | 3 hr/day     | 0.10        | \$0.02                    | 3.06          | \$0.46                      |
| Incandescent, Energy-Saving                 | 52              | 3 hr/day     | 0.16        | \$0.02                    | 4.68          | \$0.70                      |
| Incandescent, Energy-Saving                 | 67              | 3 hr/day     | 0.20        | \$0.03                    | 6.03          | \$0.90                      |
| Incandescent, Energy-Saving                 | 90              | 3 hr/day     | 0.27        | \$0.04                    | 8.10          | \$1.22                      |
| Incandescent, Energy-Saving                 | 135             | 3 hr/day     | 0.41        | \$0.06                    | 12.15         | \$1.82                      |
| Fluorescent, 4-foot tube                    | 44              | 3 hr/day     | 0.13        | \$0.02                    | 3.96          | \$0.59                      |

<sup>B</sup> A 400-gallon hot tub contains 3300 pounds of water and requires 30 kWh to heat from 70 to 100 degrees F. Maintaining a covered hot tub at 100 degrees F continuously could possibly require about 400 kWh/month with a conventional resistance type heating element. The use of a heat pump water heater will reduce hot tub energy requirements by about 70 percent.

<sup>+</sup> Thermostatically controlled appliance. Figures based on industry estimated "on" time.

\* Based on \$0.15 per kWh.

| Item   | Typical Wattage | Unit of Use | kWh per Use | Cost per Use*    | kWh per Month | Cost per Month* |
|--|-----------------|-------------|-------------|------------------|---------------|-----------------|
| <b>Lighting, Household, Fluorescent, Watt Miser</b>      | 38              | 3 hr/day    | 0.11        | \$0.02           | 3.42          | \$0.51          |
| Fluorescent, Circle                                      | 25              | 3 hr/day    | 0.08        | \$0.01           | 2.25          | \$0.34          |
| Compact Fluorescent, Equivalent to 40-watt incandescent  | 11              | 3 hr/day    | 0.03        | less than \$0.01 | 0.99          | \$0.15          |
| Compact Fluorescent, Equivalent to 60-watt incandescent  | 13              | 3 hr/day    | 0.04        | \$0.01           | 1.17          | \$0.18          |
| Compact Fluorescent, Equivalent to 75-watt incandescent  | 18              | 3 hr/day    | 0.05        | \$0.01           | 1.62          | \$0.24          |
| Compact Fluorescent, Equivalent to 100-watt incandescent | 26              | 3 hr/day    | 0.08        | \$0.01           | 2.34          | \$0.35          |
| <b>Lighting, Outdoor, Bug Flood</b>                      | 40              | 3 hr/day    | 0.12        | \$0.02           | 3.60          | \$0.54          |
| Flood  | 150             | 3 hr/day    | 0.45        | \$0.07           | 13.50         | \$2.03          |
| Tungsten/Halogen   | 45              | 3 hr/day    | 0.14        | \$0.02           | 4.05          | \$0.61          |
| Tungsten/Halogen   | 90              | 3 hr/day    | 0.27        | \$0.04           | 8.10          | \$1.22          |
| <b>Make-Up Mirror</b>                                    | 40              | 30 min/day  | 0.02        | less than \$0.01 | 0.60          | \$0.09          |
| <b>Medical Equipment, Air Compressor</b>                 | 265             | 8 hr/day    | 2.12        | \$0.32           | 63.60         | \$9.54          |
| C-pap (for sleep apnea)                                  | 85              | 8 hr/day    | 0.68        | \$0.10           | 20.40         | \$3.06          |
| Feeding Pump   | 100             | 24 hr/day   | 2.40        | \$0.36           | 72.00         | \$10.80         |
| Oxygen Concentrator                                      | 480             | 8 hr/day    | 3.84        | \$0.58           | 115.20        | \$17.28         |
| Specialty Bed  | 85              | 24 hr/day   | 2.04        | \$0.31           | 61.20         | \$9.18          |
| Suction Unit   | 300             | 15 min/day  | 0.08        | \$0.01           | 2.25          | \$0.34          |
| <b>Microwave Oven</b>                                    | 1500            | 20 min/day  | 0.50        | \$0.08           | 15.00         | \$2.25          |
| <b>Mixer, Hand</b>                                       | 80              | 1 hr/month  | 0.08        | \$0.01           | 0.08          | \$0.01          |
| <b>Mixer, Stand</b>                                      | 325             | 1 hr/month  | 0.33        | \$0.05           | 0.33          | \$0.05          |
| <b>Motors, Running at Full Load, ¼ HP</b>                | 250             | 1 hr/month  | 0.25        | \$0.04           | 0.25          | \$0.04          |
| Running at Full Load, ½ HP                               | 330             | 1 hr/month  | 0.33        | \$0.05           | 0.33          | \$0.05          |
| Running at Full Load, ¾ HP                               | 500             | 1 hr/month  | 0.50        | \$0.08           | 0.50          | \$0.08          |
| Running at Full Load, 1 HP                               | 750             | 1 hr/month  | 0.75        | \$0.11           | 0.75          | \$0.11          |
| Running at Full Load, 1 HP                               | 1000            | 1 hr/month  | 1.00        | \$0.15           | 1.00          | \$0.15          |
| Running at Full Load, 1½ HP                              | 1500            | 1 hr/month  | 1.50        | \$0.23           | 1.50          | \$0.23          |
| Running at Full Load, 2 HP                               | 2000            | 1 hr/month  | 2.00        | \$0.30           | 2.00          | \$0.30          |

\* Based on \$0.15 per kWh.

| Item   | Typical Wattage | Unit of Use  | kWh per Use    | Cost per Use*        | kWh per Month | Cost per Month*     |
|--|-----------------|--------------|----------------|----------------------|---------------|---------------------|
| Outdoor Grill  | 1500            | 2 hr/month   | 3.00           | \$0.45               | 3.00          | \$0.45              |
| <b>Power Tools, Drill</b>  | 250             | 1 hr/month   | 0.13           | \$0.02               | 0.13          | \$0.02 <sup>c</sup> |
| Grinder  | 250             | 1 hr/month   | 0.13           | \$0.02               | 0.13          | \$0.02 <sup>c</sup> |
| Sander, Belt   | 620             | 1 hr/month   | 0.47           | \$0.07               | 0.47          | \$0.07 <sup>c</sup> |
| Sander, Disc   | 250             | 1 hr/month   | 0.19           | \$0.03               | 0.19          | \$0.03 <sup>c</sup> |
| Saws, Circular   | 1200            | 1 hr/month   | 0.54           | \$0.08               | 0.54          | \$0.08 <sup>c</sup> |
| Saws, Jig  | 360             | 1 hr/month   | 0.22           | \$0.03               | 0.22          | \$0.03 <sup>c</sup> |
| Saws, Table  | 1380            | 1 hr/month   | 0.55           | \$0.08               | 0.55          | \$0.08 <sup>c</sup> |
| Saws, Chain  | 1380            | 1 hr/month   | 0.55           | \$0.08               | 0.55          | \$0.08 <sup>c</sup> |
| Soldering Iron   | 600             | 1 hr/month   | 0.60           | \$0.09               | 0.60          | \$0.09              |
| Popcorn Popper, Hot Air  | 1200            | 15 min/month | 0.30           | \$0.05               | 0.30          | \$0.05              |
| Popcorn Popper, Oil  | 600             | 30 min/month | 0.30           | \$0.05               | 0.30          | \$0.05              |
| Pressure Cooker  | 1300            | 4 hr/month   | 5.20           | \$0.78               | 5.20          | \$0.78              |
| Radio  | 5-70            | 6 hr/day     | 0.03 –<br>0.42 | \$0.0045 –<br>\$0.15 | 0.9 –<br>12.6 | \$0.14 –<br>\$1.89  |
| <b>Range, Small Surface Unit</b>                                 | 1300            | 15 min/day   | 0.17           | \$0.03               | 5.20          | \$0.78              |
| Large Surface Unit   | 2400            | 15 min/day   | 0.32           | \$0.05               | 9.60          | \$1.44              |
| Oven Bake Unit,<br>Self-Cleaning                                 | 3200            | 2 hr/week    | 2.40           | \$0.36               | 9.60          | \$1.44              |
| Oven Bake Unit,<br>Manual Cleaning                               | 3200            | 2 hr/week    | 3.20           | \$0.48               | 12.80         | \$1.92              |
| Oven Broil Unit  | 3600            | 15 min/week  | 0.90           | \$0.14               | 3.60          | \$0.54              |
| Self-Cleaning Cycle  |                 |              | 3.00           |                      |               | \$0.45              |
| <b>Refrigerator/Freezer – See Table for Refrigerator/Freezer</b> |                 |              |                |                      |               |                     |
| Rice Cooker  | 500             | 20 min/day   | 0.17           | \$0.03               | 5.00          | \$0.75              |
| Roaster  | 1350            | 4 hr/month   | 3.11           | \$0.47               | 3.11          | \$0.47+             |
| Rotisserie   | 1500            | 2 hr/month   | 3.00           | \$0.45               | 3.00          | \$0.45              |
| Sandwich Grill   | 1200            | 15 min/week  | 0.24           | \$0.04               | 0.96          | \$0.14+             |
| Sewing Machine   | 100             | 5 hr/month   | 0.50           | \$0.08               | 0.50          | \$0.08              |
| Shaver   | 15              | 4 min/day    | 0.0010         | less than<br>\$0.01  | 0.03          | \$0.0045            |
| Slow Cooker  | 200             | 5 hr/week    | 1.00           | \$0.15               | 4.00          | \$0.60              |

<sup>c</sup> Not running continually at full load.

\* Based on \$0.15 per kWh.

| Item   | Typical Wattage | Unit of Use  | kWh per Use | Cost per Use*    | kWh per Month     | Cost per Month†      |
|--|-----------------|--------------|-------------|------------------|-------------------|----------------------|
| <b>Swimming Pool Pump</b><br>(1 horsepower)                                  | 1000            | 8 hr/day     | 8.00        | \$1.20           | 240.00            | \$36.00              |
| <b>Swimming Pool Sweep</b><br>(¼ horsepower)                                 | 750             | 93 hr/month  | 69.75       | \$10.46          | 69.75             | \$10.46              |
| <b>Television – see Electronics-Video-TV</b>                                 |                 |              |             |                  |                   |                      |
| <b>Toaster Oven/Broiler – Toasting</b>                                       | 1500            | 4 min/day    | 0.10        | \$0.02           | 3.00              | \$0.45               |
| <b>Toaster Oven/Broiler – Oven</b>   | 1500            | 20 min/day   | 0.13        | \$0.02           | 3.75              | \$0.56+              |
| <b>Toaster Oven/Broiler – Broiler</b>  | 830             | 10 min/day   | 0.10        | \$0.01           | 2.91              | \$0.44+              |
| <b>Toothbrush</b>  | 7               | 4 min/day    | 0.0005      | less than \$0.01 | 0.01              | \$0.0021             |
| <b>Trash Compactor</b>   | 400             | 2 min/day    | 0.01        | less than \$0.01 | 0.40              | \$0.06               |
| <b>Typewriter</b>  | 60              | 10 min/day   | 0.01        | less than \$0.01 | 0.30              | \$0.05               |
| <b>Vacuum Cleaner</b>  | 650             | 1.25 hr/week | 0.81        | \$0.12           | 3.25              | \$0.49               |
| <b>Video Game Console, 32 bit – see Electronics-Video-Video Game Console</b> |                 |              |             |                  |                   |                      |
| <b>Waffle Iron</b>   | 1200            | 1 hr/month   | 1.00        | \$0.15           | 1.00              | \$0.15+              |
| <b>Warming Tray</b>  | 150             | 2 hr/month   | 0.15        | \$0.02           | 0.15              | \$0.02+              |
| <b>Water Heater-Conventional</b>   | 4000            |              |             |                  | 240.0 –<br>400.0  | \$36.00 –<br>\$60.00 |
| <b>Water Heater-Heat Pump</b>  | 1400            |              |             |                  | 140.0 –<br>280.0  | \$21.00 –<br>\$42.00 |
| <b>Water Heater-Solar</b> (circulating water pump and rainy weather standby) |                 |              |             | 80.0             | 20.0 –<br>\$12.00 | \$3.00 –             |
| <b>Waterbed Heater</b>   | 375             | 24 hr/day    | 3.00        | \$0.45           | 90.00             | \$13.50+             |
| <b>Wok</b>   | 1000            | 15 min/week  | 0.20        | \$0.03           | 0.80              | \$0.12+              |

+ Thermostatically controlled appliance. Figures based on industry estimated "on" time.  
 \* Based on \$0.15 per kWh.

| Item                         | Size in<br>Cubic<br>Feet | Defrost Type | MANUFACTURED<br>BEFORE 1980 |                    |
|------------------------------|--------------------------|--------------|-----------------------------|--------------------|
|                              |                          |              | kWh per<br>month            | Cost per<br>month* |
| <b>Refrigerator/Freezer</b>  |                          |              |                             |                    |
| Top Freezer                  | 10-16                    | manual       | 50-80                       | \$7.50 – \$12.00   |
| Top Freezer                  | 12-14                    | partial      | 80-130                      | \$12.00 – \$19.50  |
| Top Freezer                  | 10-14                    | automatic    |                             |                    |
| Top Freezer                  | 14-18                    | automatic    | 120-180                     | \$18.00 – \$27.00  |
| Top Freezer                  | 19-21                    | automatic    | 135-200                     | \$20.25 – \$30.00  |
| Top Freezer                  | 22-25                    | automatic    |                             |                    |
| Bottom Freezer               | 9-12                     | automatic    |                             |                    |
| Bottom Freezer               | 15-18                    | automatic    |                             |                    |
| Bottom Freezer               | 19-21                    | automatic    |                             |                    |
| Bottom Freezer               | 22-25                    | automatic    | 150-180                     | \$22.50 – \$27.00  |
| Side-by-Side                 | 10-21                    | automatic    |                             |                    |
| Side-by-Side                 | 19-22                    | automatic    | 140-250                     | \$21.00 – \$37.50  |
| Side-by-Side                 | 23-25                    | automatic    | 150-300                     | \$22.50 – \$45.00  |
| Side-by-Side                 | 26-31                    | automatic    |                             |                    |
| Compact Refrigerator/Freezer | 4                        | manual       |                             |                    |
| Compact Refrigerator/Freezer | 4                        | automatic    |                             |                    |
| <b>Freezer Only</b>          |                          |              |                             |                    |
| Chest Freezer                | 12-16                    | manual       | 80-100                      | \$12.00 – \$15.00  |
| Chest Freezer                | 17-22                    | manual       | 100-130                     | \$15.00 – \$19.50  |
| Upright Freezer              | 12-16                    | manual       | 90-115                      | \$13.50 – \$17.25  |
| Upright Freezer              | 17-20                    | manual       | 100-140                     | \$15.00 – \$21.00  |
| Upright Freezer              | 12-16                    | automatic    | 130-180                     | \$19.50 – \$27.00  |
| Upright Freezer              | 17-20                    | automatic    | 140-200                     | \$21.00 – \$30.00  |
| <b>Refrigerator Only</b>     |                          |              |                             |                    |
| Compact Refrigerator         | 2-6                      | manual       |                             |                    |
| Compact Refrigerator         | 3-6                      | automatic    |                             |                    |
| Non Compact Refrigerator     | 9-17                     | manual       |                             |                    |
| Non Compact Refrigerator     | 9-20                     | automatic    |                             |                    |

| MANUFACTURED<br>AFTER 1980 |                    | MANUFACTURED<br>AFTER 2001 |                    | ENERGY STAR® (After 2001) |                    |
|----------------------------|--------------------|----------------------------|--------------------|---------------------------|--------------------|
| kWh per<br>month           | Cost per<br>month* | kWh per<br>month           | Cost Per<br>month* | kWh per<br>month          | Cost per<br>month* |
| 40-60                      | \$6.00 – \$9.00    |                            |                    |                           |                    |
| 65-100                     | \$9.75 – \$15.00   | 29-33                      | \$4.35 – \$4.95    | 14-21                     | \$2.10 – \$3.15    |
|                            |                    | 33-37                      | \$4.95 – \$5.55    | 28-31                     | \$4.20 – \$4.65    |
| 65-140                     | \$9.75 – \$21.00   | 37-47                      | \$5.55 – \$7.05    | 31-34                     | \$4.65 – \$5.10    |
| 75-160                     | \$11.25 – \$24.00  | 41-50                      | \$6.15 – \$7.50    | 32-37                     | \$4.80 – \$5.55    |
|                            |                    | 44-47                      | \$6.60 – \$7.05    | 35-40                     | \$5.25 – \$6.00    |
|                            |                    | 42-44                      | \$6.30 – \$6.60    | 36-37                     | \$5.40 – \$5.55    |
|                            |                    | 45-46                      | \$6.75 – \$6.90    | 38-39                     | \$5.70 – \$5.85    |
|                            |                    | 47-48                      | \$7.05 – \$7.20    | 37-40                     | \$5.55 – \$6.00    |
| 85-90                      | \$12.75 – 13.50    | 48-50                      | \$7.20 – \$7.50    | 39-42                     | \$5.85 – \$6.30    |
|                            |                    | 48-54                      | \$7.20 – \$8.10    | 41-46                     | \$6.15 – \$6.90    |
| 90-180                     | \$13.50 – \$27.00  | 53-57                      | \$7.95 – \$8.55    | 45-49                     | \$6.75 – \$7.35    |
| 100-200                    | \$15.00 – \$30.00  | 55-62                      | \$8.25 – \$9.30    | 45-52                     | \$6.75 – \$7.80    |
|                            |                    | 55-67                      | \$8.25 – \$10.05   | 47-57                     | \$7.05 – \$8.55    |
|                            |                    | 29                         | \$4.35             | 22                        | \$3.30             |
|                            |                    | 34                         | \$5.10             | 20                        | \$3.00             |
| 35-70                      | \$5.25 – \$10.50   | 29-36                      | \$4.35 – \$5.40    | 25-30                     | \$3.75 – \$4.50    |
| 40-100                     | \$6.00 – \$15.00   | 41-43                      | \$6.15 – \$6.45    | 35-38                     | \$5.25 – \$5.70    |
| 50-80                      | \$7.50 – \$12.00   | 30-38                      | \$4.50 – \$5.70    | 24-34                     | \$3.60 – \$5.10    |
| 60-110                     | \$9.00 – \$16.50   | 29-40                      | \$4.35 – \$6.00    | 33-40                     | \$4.95 – \$6.00    |
| 70-125                     | \$10.50 – \$18.75  | 52-54                      | \$7.80 – \$8.10    | 47-49                     | \$7.05 – \$7.35    |
| 90-150                     | \$13.50 – \$22.50  | 57-64                      | \$8.55 – \$9.60    | 51-57                     | \$7.65 – \$8.55    |
|                            |                    | 26-30                      | \$3.90 – \$4.50    | 21-23                     | \$3.15 – \$3.45    |
|                            |                    | 33-36                      | \$4.95 – \$5.40    | 25-28                     | \$3.75 – \$4.20    |
|                            |                    | 27-33                      | \$4.05 – \$4.95    | 19-28                     | \$2.85 – \$4.20    |
|                            |                    | 30-39                      | \$4.50 – \$5.85    | 17-34                     | \$2.55 – \$5.10    |

\* Based on \$0.15 per kWh.



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# General Electrical Information

## **Knowing the Meaning of Electrical Terms**

### **Circuit Breakers, Fuse Boxes, and the Main Breaker Switch**

### **Measuring Electrical Usage**

### **Understanding Your Electric Bill**

### **Before You Buy That Large Air Conditioner or Other Large Appliance**

### **Are You Remodeling or Tearing Down Your House or Business?**

This section will help you to understand some basic electrical terms, circuit breaker panels, how consumption is measured, and your electric bill. It also includes information on things to keep in mind when considering the purchase and installation of appliances that are large energy users and important information if you plan to remodel or demolish your home.

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## Knowing the Meaning of Electrical Terms

### **Ampere (amp)**

A unit for measuring the strength of an electric current

### **Kilowatt**

A unit of electrical power equal to 1000 watts

*A kilowatt represents the rate at which energy is being used or the size of the electrical load.*

### **Kilowatt-hour (kWh)**

A unit of electrical energy equal to one kilowatt used for one hour

*(For example, a 1000-watt appliance running continually at full load for one hour will consume one kWh of energy; a 100-watt light bulb left on for ten hours will consume one kWh of energy.)*

### **Volt**

A unit of electrical pressure, the force at which electrical charges move through conductors

*(In most homes, 120-volt service is supplied to all wall outlets and lights and 240-volt service is supplied to large appliances—electric ranges, water heaters, clothes dryers, and larger air conditioners.)*

### **Watt**

A unit of electrical power

*A watt represents the amount of electricity required to power a light bulb, an appliance, or other electrical equipment.*

## Circuit Breaker, Fuse Boxes, and the Main Breaker Switch

### Circuit breakers and fuse boxes

Your household controls electric service through a panel or box called a circuit breaker panel or fuse box. These days, it's more common for a house to have a circuit breaker panel. Circuit breaker panels or fuse boxes contain breakers or fuses of different capacities. Each circuit's capacity is labeled by "amps," which is a unit that measures the amount of electric current flowing in the circuit. Electric ranges usually require 50-amp breakers, electric water heaters and clothes dryers require 30-amp breakers, and convenience outlets and lighting circuits require 15 to 20-amp breakers.

Fuses or circuit breakers are devices that limit the amount of current a circuit will carry. They protect the wires and equipment from overheating, which could create fire hazards. They are designed to automatically open or "break" a circuit should the amount of current exceed the rated design of the circuit. Fuses contain a soft metal filament that melts when too much current flows through them. Circuit breakers are designed to trip a switch. The maximum wattage a 15-amp breaker should carry is 1380 watts, a 20-amp breaker 1840 watts. (This equals 80% of the circuit breaker rating.)

$$\begin{aligned} 15 \text{ amps} \times 115 \text{ volts} &= 1725 \text{ watts (maximum)} \\ 80\% \text{ of } 1725 &= 1380 \text{ watts} \end{aligned}$$

It is important, and good practice, to label fuses or circuit breakers with the location of the circuit (e.g., bathroom, kitchen, or bedroom). Labeling your devices will aid you in case of a power outage or when you need to turn the power off in a certain area of your home before doing repair or maintenance work.

To prevent circuit breakers from sticking or malfunctioning, it's good practice to exercise your breakers once a year by turning them **off** and **on** three times.

### Main breaker or main fusible switch

A main breaker or switch is used to cut off power to your entire home. It is usually located by the electric meter on your home, although some circuit breaker panels also contain the main breaker switch. In an emergency, such as during an appliance fire or while rescuing a person from household electrical shock, cut off the power to your house at the main breaker or switch. However, if it's faster for you to access your circuit breaker panel or your fuse box than the main breaker or switch, turn off all the breakers or unscrew all the fuses to cut off power to the house.

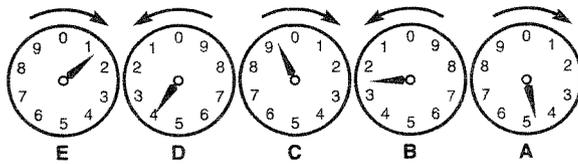
## Measuring Electrical Usage

The electricity you buy is measured by a meter at your home. Your meter is normally read every month, and you are sent a bill for the number of kilowatt-hours (kWh) that you have used.

Your electric bill contains all the information you need about your power usage. However, if you are interested, following are instructions on how to read your meter.

### Reading your Electric Meter

- Dials on the meter move alternately clockwise and counter-clockwise (see dials below).
- Read the lower number when a hand points between two numbers (as in dials A, B, C, E).
- Sometimes a hand seems to be pointing directly at a number (dial D). To find out if that number has been reached yet, look at the dial to the immediate right (dial C). If the hand on the dial to the right (dial C) has passed zero, then use the number at which dial D seems to be pointing. If dial C has not passed zero, then use the number that is smaller than the one at which dial D is pointing.



The correct reading for this meter is 13924.

## Understanding Your Electric Bill

### Why Electric Bills Vary Monthly

- **Billing Periods** – Electric bills vary due to the length of the billing period, which can range from 27 to 33 days. Your bill provides an average of the kilowatt-hours used and the related cost per day. Be sure to look at these figures—not just the total dollar amount of the bill—when comparing monthly bills.
- **Monthly Fluctuations** – Your use of electricity fluctuates monthly, even if the number of days in the billing period is the same. Weather conditions, a new appliance, a vacation, a change in lifestyle, a new baby or additional family member, or a guest, can all affect your monthly bill. Houseguests may contribute to higher energy use through increased meal preparation, loads of laundry, and bathing.
- **Seasonal Use** – On shorter, cooler winter days, one can expect to use more electricity due to increased lighting and hot water use. Longer, warmer summer days warrant longer use of air conditioners and fans. Extra trips to the refrigerator/freezer for cool drinks and ice also use more electricity.
- **Vacations** – Your bill may be lower, but if it is not, check the dates of the billing period. Do they coincide with the days you were on vacation? Many electric appliances continue to work even when you are on vacation—the refrigerator, water heater, clocks, security lights, etc.—unless you have turned the circuit breakers off. Also, extra laundry may have been done before and after your vacation.
- **Production costs** – The fuel and purchased power we use to produce electricity fluctuate in cost; any increase or decrease in these costs are reflected in your monthly bill. In addition, billing rates occasionally change after justification and approval by the Hawaii Public Utilities Commission.

### Why Your Electric Bill May Not Be The Same As Your Neighbors'

Neighbors with similar electric bills are uncommon, even if their homes are identical in size, have the same number of family members, and have the same type and number of appliances. Each family has its own unique interests and lifestyles. Some families cook a lot, use more hot water, and use appliances more. Other families practice using energy more efficiently. This difference is reflected in their monthly utility bill. The use of electricity varies according to a family's: needs; activities; and the number, age, type, and efficiency of appliances. Your bill will rarely, if ever, be the same as your neighbors'.

## **Before You Buy That Large Air Conditioner or Other Large Appliance**

An average home with standard electric appliances that is ventilated with Hawaii's natural breezes generally requires electric service of 100 amps, usually supplied by a 100-amp underground cable. Some newer homes are built with 200-amp service.

**If you are considering the purchase of equipment or appliances that use a large amount of electric power** (such as an air conditioner unit that's larger than 12,000 Btu/H (1 TON) or an additional electric oven, or a Jacuzzi, or a tankless (instantaneous) water heater, **you may need to have your home's electrical wiring and electric service upgraded.** Consult with a licensed electrician who will work with your electric company to coordinate and schedule the work if an upgrade is needed.

If an upgrade in electrical service is needed (upgrading from 60 amps or 100 amps to 200 amps for example), the customer is responsible for the following costs:

- Purchase and installation of a new meter socket;
- New service drop (larger wires) to provide more capacity;
- Specific requirements as per the electric company's customer engineering department.

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## Are you remodeling or tearing down your home or business?

HECO, HELCO, and MECO have important information that will help your remodel or demolition go a lot smoother.

- **You must close your electric account.** The person whose name appears on the electric bill is the only one who can close the account. We require the customer to sign off on the account before any type of service can be done.
- **Please inform the electric company at least ten working days in advance.** In addition to meeting other utilities' requirements for demolitions, advance notice enables us to remove service lines and meters attached to the house in time for the scheduled demolition. Some homes have underground service lines, and it can take a little longer to identify and remove the lines.
- **Advance notice helps ensure your demolition can safely proceed as scheduled.** Demolition crews will postpone the job until the electric company removes the lines and meters. If the job is postponed, you may end up paying a higher demolition cost.
- **For safety and security reasons, only electric company personnel are authorized to remove the service lines and meters.** If the lines are still in place, the house could still be energized, making demolition very dangerous.
- **HECO Customers**
  - To close your HECO account, please call our Customer Service Department at **548-7311**.
  - To inform us about a demolition or if you have any questions, please call our Customer Installations Department at **543-5604**, **543-5623**, or **543-7090**.
- **HELCO Customers**
  - To close your HELCO account, please call our Customer Service Department at **969-6999**.
  - To inform HELCO about a demolition or if you have any questions, please call **969-0311** (Hilo) or **327-0510** (Kona).

## Are you remodeling or tearing down your home or business? (continued)

- **MECO Customers**

- To close your MECO account, please call our Customer Service Department at:

- **871-9777** on Maui

- **1-877-871-8461** (toll free) on Lanai

- **1-877-871-8461** (toll free) on Molokai

- To inform MECO about a demolition or if you have any questions, please call **871-2390**.

## Other Sources of Useful Information

Following is a list of websites that offer useful information on energy efficiency and energy conservation.

- **The Alliance to Save Energy**, a non-profit coalition of business, government, environmental, and consumer leaders, offers consumers information they need to save money, increase comfort, and even reduce pollution through energy efficiency.  
<http://www.ase.org/section/aboutus/>
- **The American Council for an Energy-Efficient Economy (ACEEE)** is a nonprofit organization dedicated to advancing energy efficiency as a means of promoting both economic prosperity and environmental protection.  
<http://www.aceee.org/consumer/consumer.htm>
- **The California Energy Commission**, Consumer Energy Center offers energy-saving tips.  
<http://www.consumerenergycenter.org/flex/tips.html>
- **The Consortium for Energy Efficiency (CEE)**, a nonprofit public benefits corporation, develops national initiatives to promote the manufacture and purchase of energy-efficient products and services.  
<http://www.cee1.org/resid/resid-main.php3>
- **ENERGY STAR®** is a government-backed program helping businesses and individuals protect the environment through superior energy efficiency.  
<http://www.energystar.gov/index.cfm?c=home.index>
- **Hawaii State Department of Business, Economic Development, and Tourism (DBEDT)** offers ideas on how to save money on your energy bills and information on energy tax credits.  
[http://www.hawaii.gov/dbedt/ert/e\\_save.html](http://www.hawaii.gov/dbedt/ert/e_save.html)
- **“Field Guide for Energy Performance, Comfort, and Value in Hawaii Homes”** was developed by the Hawaii State Department of Business, Economic Development, and Tourism (DBEDT) together with the Honolulu Chapter of American Institute of Architects (AIA). This guide identifies significant opportunities to reduce energy use, improve comfort, lower utility bills, provide value, and improve quality of life for Hawaii’s homeowners. The guide is available for download as a PDF document at the DBEDT website or you may obtain a copy of the report by calling (808) 587-3807.  
<http://www.hawaii.gov/dbedt/ert/fieldguide/fieldguide.html>

## Other Sources of Useful Information (continued)

- **Hawaiian Electric Company** has information about how to save energy and up-to-date information on rebate programs that can help offset the cost of purchasing energy-efficient technologies. It also has a handy calculator that can help you determine the right-sized room air conditioner.

<http://www.heco.com>

- **The Home Energy Saver** project is sponsored by the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA), as part of the national ENERGY STAR Program for improving energy efficiency in homes.

<http://hes.lbl.gov/hes/about.html>

- **Lightsite.net** provides information on energy-efficient lighting products. The site has a handy calculator that can help you estimate how much you can save by using a compact fluorescent light bulb compared to an incandescent bulb.

<http://www.lightsite.net/savingsCalculator.php4>

- **U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy** offers tips on saving energy and money at home.

[http://www.eere.energy.gov/consumerinfo/energy\\_savers/](http://www.eere.energy.gov/consumerinfo/energy_savers/)

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## Notes

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# Notes

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes the need for transparency and accountability in financial reporting.

2. The second part of the document outlines the various methods used to collect and analyze data. It includes a detailed description of the experimental procedures and the statistical techniques employed.

## Call Us For Assistance

### Customer Service For

- Start of and termination of service
- Payment arrangements
- Billing Information

|                    |                               |                                    |
|--------------------|-------------------------------|------------------------------------|
| Oahu               | 548-7311                      | weekdays<br>6:30 a.m. to 6:00 p.m. |
| Maui               | 871-9777                      | weekdays<br>7:00 a.m. to 4:00 p.m. |
| Lanai              | 1-877-871-8461<br>(toll free) | weekdays<br>7:00 a.m. to 4:00 p.m. |
| Molokai            | 1-877-871-8461<br>(toll free) | weekdays<br>7:00 a.m. to 4:00 p.m. |
| Hilo, Puna and Kau | 969-6999                      | weekdays<br>7:30 a.m. to 4:00 p.m. |
| Kona               | 329-3584                      | weekdays<br>7:30 a.m. to 3:30 p.m. |
| Kamuela            | 885-4605                      | weekdays<br>7:30 a.m. to 3:30 p.m. |

### Trouble Dispatch For

- Dimming or bright lights
- Lights out

|                    |                               |                                    |
|--------------------|-------------------------------|------------------------------------|
| Oahu               | 548-7961                      | 24 hours                           |
| Maui               | 871-7777                      | 24 hours                           |
| Lanai              | 1-877-871-8461<br>(toll free) | 24 hours                           |
| Molokai            | 1-877-871-8461<br>(toll free) | 24 hours                           |
| Hilo, Puna and Kau | 969-6666                      | 24 hours                           |
| Kona               | 329-3584                      | weekdays<br>7:30 a.m. to 3:30 p.m. |
|                    | 969-6666                      | after hours                        |
| Kamuela            | 885-4605                      | weekdays<br>7:30 a.m. to 3:30 p.m. |
|                    | 969-6666                      | after hours                        |

### Consumer Education For

- Residential appliance operating costs & information
- School programs

|        |          |                                    |
|--------|----------|------------------------------------|
| Oahu   | 543-7511 | weekdays<br>7:30 a.m. to 4:00 p.m. |
| Maui   | 871-2323 | weekdays<br>7:30 a.m. to 4:00 p.m. |
| Hawaii | 969-0137 | weekdays<br>7:30 a.m. to 4:00 p.m. |



**Hawaiian Electric Company**  
PO Box 2750 • Honolulu, Hawaii 96840-0001

**Maui Electric Company**  
PO Box 398 • Kahului, Hawaii 96732-0398

**Hawaii Electric Light Company**  
PO Box 1027 • Hilo, Hawaii 96721-1027

