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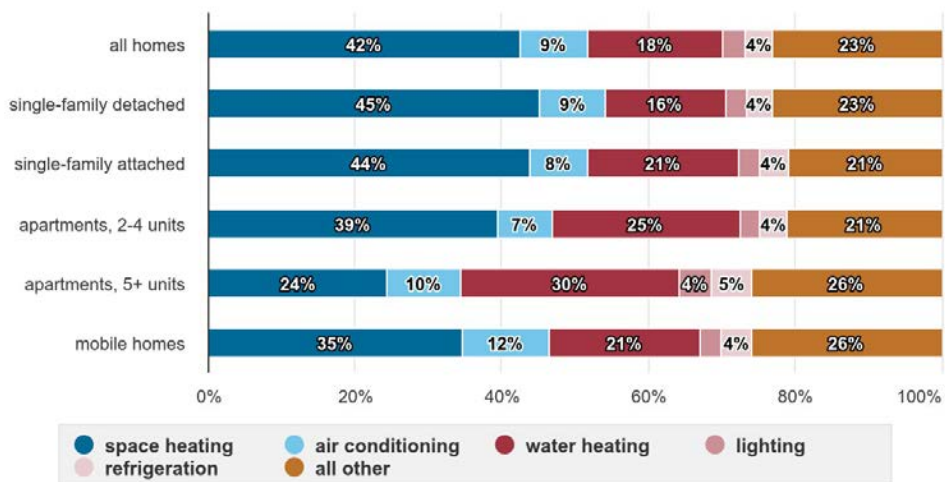
ENERGY SAVING APPLIANCES

Introduction

In past newsletters, we concentrated on building systems, building science, and building technologies that lead to airtight houses that are insulated and ventilated correctly to minimize the largest energy expenditure homeowners incur—heating and cooling costs. However, according to the U.S. Energy Information Administration, heating and cooling costs typically account for just over one-half of the energy costs homeowners incur. The balance of these costs is for lighting, water heating, refrigeration, cooking, laundry, and other appliances.

With the exception of water heating, household appliances are usually chosen by the homeowner or landlord based on personal preferences and cost and are not typically included in the design process for new homes. However, choosing energy-saving appliances can save both energy and money over the long term, and often the higher initial costs of energy-efficient appliances can be offset by rebates and tax credits. In this newsletter, we will explore the options available to designers and homeowners.

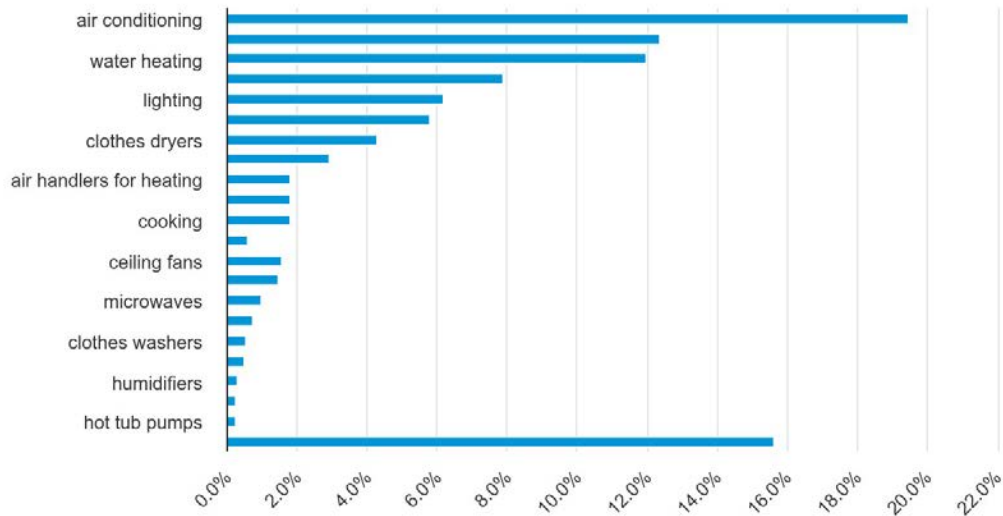
End-use consumption shares by type of U.S. home, 2020



Data source: U.S. Energy Information Administration, 2020 Residential Energy Consumption Survey
 Note: Shares are a percentage of annual site energy consumption. Site energy consumption excludes the losses in electricity generation and delivery.

Residential site electricity consumption by end use, 2020

percent of total



Data source: U.S. Energy Information Administration, 2020 Residential Energy Consumption Survey

Water Heating

Following space heating and cooling, domestic water heating represents the second-largest energy expenditure in most homes. According to the U.S. Department of Energy, a typical home will spend \$400-\$600 a year on water heating, representing 14% to 18% of their total utility bills. It makes sense that when installing or replacing a water-heating system, the design and type of water heater should be given priority consideration for long-term savings. The water heater with the lowest initial cost will not necessarily be the best investment over the long run especially considering that incentives may be available in your area that make it economical to choose a more expensive energy-efficient unit that will save energy and money over the long run.

Most water heaters installed in homes today are simple storage-tank units that have the lowest initial costs. These units use electricity, natural gas, or propane and, while they may have the lowest up-front costs, they cost more per gallon of heated water than their energy-efficient counterparts. However, their energy efficiency can be improved by installing an insulating blanket and insulating the hot water pipes from the unit to the plumbing fixtures that use the hot water. As these units wear out and need replacing, homeowners should consider units that use less energy.

Heat pump water heaters are gaining in popularity for both new construction and replacement of electric units. Heat pump water heater technology is not new, but it has increased in popularity as reducing energy consumption has become a higher priority. A heat pump water heater uses the warm ambient air in the proximity of the water heater, as a normal heat pump does, to heat the water and exhausts cool air into the room where it is located, unless this exhaust is vented to the outside. The downside of this cool exhaust in a cold climate is that the heating system may operate less efficiently, or it may cause comfort issues if the water heater is not properly located. Another complaint with heat pump water heaters is that the fan creates noise, where a storage-tank unit is normally silent. However, these challenges are easily overcome in an intelligently designed system may be an ideal solution in new construction. According to the Environmental Protection Agency's ENERGY STAR program, a certified heat pump water heater can save a household of four approximately \$550 per year on electric bills compared to a standard electric water heater and more than \$5,610 over the unit's lifetime.

In addition to local utility rebates, heat pump water heaters are eligible for a federal tax credit. This tax credit is available for qualifying units installed on or after January 1, 2023. The tax credit will cover 30% of the water heater's cost, plus installation, up to \$2,000.00. Only heat pump water heaters that have earned the STAR certification are eligible for this tax credit. Qualifying products can be found at ENERGY STAR webpage at energystar.gov/productfinder/product/certified-water-heaters/results.

Another energy-saving alternative is the *tankless water heater*. Whole-house gas tankless water heaters apply the same principle to heat water as standard gas water heaters, but without a storage tank. They save energy by heating water only when needed, eliminating the energy lost maintaining a conventional water heater's storage tank temperature. When a hot water tap is turned on in the home, cold water is drawn into the water heater. A flow sensor activates the gas burner, which warms the heat exchanger. Incoming cold water encircles the heat exchanger and leaves the heater at its set-point temperature. Combustion gases safely exit through a dedicated, sealed vent system. By heating water only when needed, rather than maintaining the water temperature in a tank full of hot water at all times, tankless water heaters can achieve greater efficiency than standard tank-type water heaters ENERGY STAR estimates that whole-house tankless water heaters use about 10% less energy than a conventional water heater.

The downside of a tankless water heater is that the limited flow rate means simultaneous uses of the water heater may stretch the water heater beyond its limits. They are also expensive to install, and because of venting and condensation removal requirements, they are a less-suitable replacement for a conventional water heater.

Lighting

In the past, lighting was one of the largest energy uses for a typical household. Your parents' admonition to turn off the lights when you leave a room was the only way to minimize this cost. Today, lighting may be one the easier ways for homeowners to save on energy costs. Today's Light Emitting Diode (LED) light fixtures and bulbs are much more efficient than the incandescent lights of the past. For example, one 60-watt incandescent bulb could be replaced with a 6-watt LED bulb that would produce the same 800 lumens. If that bulb were in a heavy-use area and used eight hours a day, at .13 cents per kilowatt hour, \$1.70 per month by replacing just one bulb. For the most energy-efficient lighting choices, designers and consumers should look for ENERGY STAR-certified bulbs and fixtures, which are independently certified to deliver efficiency and performance, and typically last 15 times longer. In addition to cost savings, LED lighting, a variety of options are available to meet a homeowner's color/appearance preferences, from soft or warm light (2200K) to cool daylight (6500K), and any color in between.



Clothes Washer/Dryers

Next on the list for energy consumption are clothes dryers. Again, heat pump technology is leading for energy efficiency. According to ENERGY STAR, heat pump dryers use 30% less energy than heating-element dryers.

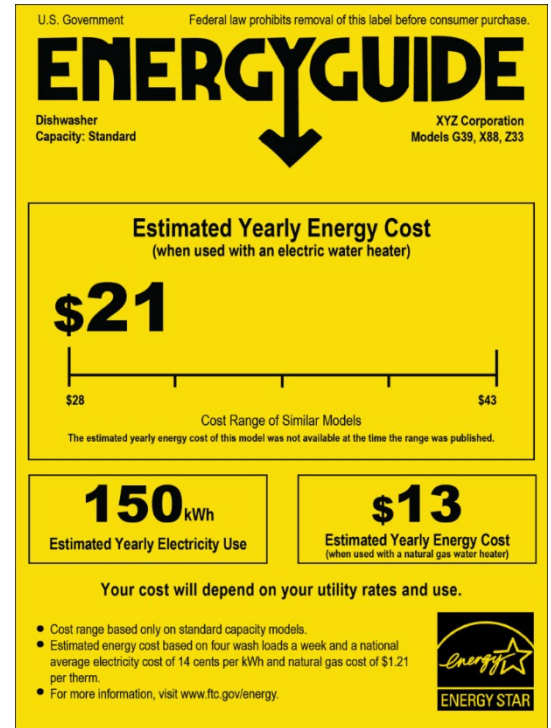
Heat pump technology is most common in washer/dryer combination units. The dryer works as a closed-loop system by heating the air and using it to remove moisture from the clothes. Because the dryer recycles the warm air once moisture is removed, the dryer is ventless. Rather than releasing moist air through a dryer vent to the exterior of the home as a conventional dryer does, a heat pump dryer passes humid air in the dryer drum through a condenser to remove the moisture without losing too much heat. The condensed moisture (water) from the drum is drained or emptied out of a holding tank in the dryer to a drain where the washing machine water is also drained. Sensors in the unit detect when clothes are dry, saving energy by using an automatic shut-off. This feature also prevents wear and tear on clothes from over-drying. Moreover, heat pump clothes dryers use lower temperatures than standard clothes dryers.

Conclusion

For each category of appliances listed in the energy-usage chart above, the ENERGY STAR program identifies models that provide certified energy savings over noncertified appliances. This newsletter has only addressed the appliances that would provide the consumer with the most “bang for the buck.” While ENERGY STAR-certified appliances are usually more expensive upfront than other appliances, the total cost over the life of the appliance may be less, and consumers can compare these costs using the ENERGY GUIDE label affixed to the appliances.

All major home appliances must meet the Appliance Standards Program set by the U.S. Department of Energy (DOE). Manufacturers must use standard test procedures developed by DOE to prove the energy use and efficiency of their products. Test results are printed on yellow EnergyGuide labels (pictured below), which manufacturers are required to display on many appliances. Studying this label will help you determine the energy savings of a particular unit.

Additionally check for rebates with your local utility. Many utilities now offer rebate programs on energy-saving appliances.



Credit: Energy Guide Label by Federal Trade Commission

References and Resources

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