

IMPROVING BUILDING PERFORMANCE

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- Residential Energy Consumption
- Energy Systems
 - Mechanical
 - Electrical
 - Plumbing
- Questions



U.S. Residential Energy Consumption

Average price of electricity in United States is 11.3 cents per kilowatt hour. Average price of natural gas is \$13.29 per million Btu.

* "Other" represents an array of household products, including stoves, ovens, microwaves, and small appliances like coffee makers 12% and dehumidifiers.

Source: Typical House memo, Lawrence Berkeley National Laboratory, 2009 and Typical house 2009 Reference.xls spreadsheet.

Where Does My Money Go?

Annual Energy Bill for a typical Single Family Home is approximately \$2,200.



Heating Cooling Water Heating Appliances (includes refrigerator, dishwasher, clothes washer and dryer) Lighting Electronics (includes computer and monitor and TV and DVD player) Other* (includes external power adapters,



Bahamas Residential Energy Consumption

• Three Basic Household Types by Population





Bahamas Residential Energy Consumption

• Share of total residential electricity consumption





Bahamas Residential Energy Consumption

 Electricity Consumption per Application – Normal Houses













- Home cooling
 - Air-conditioning is 4% of the average home energy bill since entire home is not typically cooled
 - Fan cooling is 10% of the average home
- Target: Cooling system efficiency







- North Facing Orientation
 - Less heat gain thus reducing cooling load requirements





- Window cooling unit
 - Get to know your EER, Energy Efficiency Ratio
 - Pre-1970's window units have an EER of 5
 - Today's window units have an EER of 10
 - Look for units with Energy Star labels, typically EER 10+
 - They often include timers for better air temp control
 - Make sure the unit fits tightly in the window
 - Change air filter every 3 months during peak use







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- Central Split System
 - Duct work
 - In typical, 20% of the air that moves through ducts is lost due to holes, tears, and leaks.
 - Look for holes, tears, and leaks seal with mastic or metal, never duct tape
 - Air registers
 - Clear all vents of furniture and rugs
 - Make sure connections at vents are well-sealed where duct work meets registers at walls, floors, or ceilings.







- Central Split System
 - Air filters
 - Use proper size for unit
 - Keeping air filter clean, can lower your energy consumption by 5-15%



- Change energy 3 months during peak use
- Thermostat
 - In new homes, install dual zones to separate first and second levels
 - Install a programmable thermostat to adjust temperature settings when you are away or sleeping
 - When used properly, can save up to \$300/year in energy costs









- Hot water 15% avg. home energy
 - 50% electric / 50% propane
- Cold Water



- In addition, when you use cold water, you are indirectly impact energy use, since your potable (drinking) water is reverse osmosis generated, which requires considerable energy on the WSC generation side.
- Target: Conserve Water
 - Conserve Hot Water to reduce your energy & water bill
 - Conserve Cold Water to reduce your water bill, and save energy for the utility.



- Showerheads
 - Take shorter and colder showers
 - Use a low flow showerhead
 - Standard showerheads put out up to 5 gpm
 - Low flow showerheads can cut that in half to 2.5 gpm
 - Low flow showerheads will save up to \$290 per year in energy due to less hot water generation
 - If low flow heads are not satisfactory, use an aerator showerhead to cut air flow in half.
 - A bath uses on average 30 gallons, so a 10 minute shower with a 2.5 gpm low flow showerhead will save 5 gallons of water over a bath







Faucets

- Repair faucet leaks
 - Hot water leaking at a rate of 1 drip per second can waste over 1661 gallons over the course of a year, and waste up to \$70 in electricity or natural gas
- Use less water by scraping dishes rather than rinsing them before putting into dishwasher





Dishwasher

Plumbing Systems

- Uses less hot water than washing dishes by hand
- Scrape dishes before loading in dishwasher rather than rinsing them
- Only wash full loads & use air-dry option
- Dishwashers built before 1994 waste more than 10 gallons of water per cycle
- An Energy Star dishwasher compared to a pre-1994 model, saves about:
 - 10% in energy
 - 12% in water
 - 1300 gallons of water over its lifetime







- Washing Machine
 - Use cold water whenever possible
 - Only wash full loads or reduce water level with partial loads
 - An Energy Star washing machine compared to a 10 year old unit, saves about:
 - 37% in energy
 - 50% in water









- Toilets
 - Use low flush toilets
 - Pre-1992 homes are likely to have old-fashioned 3.6 gallons per flush (gpf) models
 - Newer models use only 1.5 gpf
 - Use dual flush toilets
 - Uses less water





Irrigation

- Rainwater Capture
 - Collect in a cistern and connect to landscape irrigation
- Greywater Reuse
 - Greywater is wastewater generated from domestic activities such as laundry, dishwashing, and bathing. It does not contain sewage.
 - This water can be recycled on site for uses such as landscape irrigation





• Solar Hot Water Generation









- Appliances 36% avg. home energy
 - Refrigeration/Freezer 15% avg. home energy
 - Cooking/Microwave 4% avg. home energy
 - Washing (dishes/clothes) 1% avg. home energy
 - Dryer 3% avg. home energy
- Consumer Electronics 18% avg. home energy
- Lighting 14% avg. home energy
- Fans 10% avg. home energy
- Target: <u>Optimize/Minimize Use</u>



Refrigeration/Freezer

Appliances – 20% avg. home energy

- Energy Star qualified refrigerators are 20% more efficient than standard.
- If pre-1980, replace with Energy Star model and save more than \$200/year in energy
- If pre-1970, replace with Energy Star model and save more than \$400/year in energy
- Cooking/Microwave

- Use microwave for small portions to reduce heat generation
- Use right size pot for the stove burner
- Use Energy Star stoves, ovens, and microwaves
- Dryer
 - Little difference in energy use between models (no E Star)







How to Read the EnergyGuide Label

The EnergyGuide label gives you two important pieces of information you can use to compare different brands and models when shopping for a new appliance:





- 1. Estimated energy consumption on a scale showing a range for similar models
- 2. Estimated yearly operating cost based on the national average cost of electricity.



- Consumer Electronics 18% avg. home energy
 - Minimize number of electronics & their use
 - Use Energy Star qualified electronics where applicable ENERGY



- Even when electronics are in sleep or standby mode, they draw power, called phantom loads
 - Unplug any batter chargers or power adaptors when not in use
 - Turn computers off
 - Use a central power strip "turn off" point when you are done using equipment
- If you must leave your computer on, use a default sleep mode rather than the screen saver mode





- Lighting 14% avg. home energy
 - Turn off lights!



- Maximize use of daylight where and when possible
- Use lighter finishes to reduce the amount of light needed in the space
- Use energy efficient fixtures or bulbs (lamps)
 - Replace your five most used fixtures or bulbs with Energy Star fixtures or bulbs to save more than \$130 per year
 - Use high quality CFL, compact fluorescents, which last 6-10 times as long as incandescent, and use 75% less energy.
 - Or, use LED, which lasts 5 times as long as CFL with similar energy savings.
- Install dimmers and vacancy sensors



• Photovoltaic (PV) – Solar electric generation









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