



HOME ENERGY AND WATER EVALUATION GUIDE

*Thoughtful ways to save
resources and money*

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INTRODUCTION

This Do It Yourself (DIY) Audit Kit and corresponding Home Energy and Water Evaluation Guide has been created to provide Sarasota County homeowners with a simple and economical way to evaluate their home energy and water use and learn ways that they can save resources and money. The Kit is part of the Sarasota County Energy Upgrade program which provides residents with various levels of information on residential resource-saving opportunities. The program offers an in-depth website (www.energyupgradetoday.com) with room-by-room energy saving tips, in-person workshops, Family Sustainability Kits, and other resources.

This DIY Audit Kit is intended to serve those residents that have already gone beyond those first level actions and are ready for the next step. The kit is designed for homeowners who would like to go much further into detail in analyzing their home's energy and water use and quantifying savings. It provides a step-by-step guide, as well as the technical equipment necessary to determine specific energy and water use profiles and solutions for the home. The guide is broken into two sections: the Energy Audit and the Water Audit. You may choose to focus on only one or the other for now, or to address both at the same time. The two sections are designed to function independently to allow you that flexibility.

The kit and accompanying guide are not intended to be a replacement for professional services or advice. If at any time during the evaluation process you feel uncomfortable performing a task, stop and do not perform it! Your safety and welfare are our number one concern.

WHAT IS INCLUDED IN THE DIY AUDIT KIT?

This kit includes tools to help you evaluate your home's energy use, along with reference materials to read for additional information. These items must be *returned to the library* within three weeks of check out, so other residents can use them. The kit also includes, however, a reusable shopping bag containing energy and water saving devices that *you can keep* to begin saving money in your home right away.

Items to Return to the Library

- Backpack
- Book: *Home Energy and Water Evaluation Guide*, Sarasota County
- Book: *Shift Your Habit: Save Money, Save the Planet*, Elizabeth Rogers, 2010.
- Book: *The Blue Green Book: The Simple Water Savings Guide to Everything in Your Life*, Thomas Kostigen, 2010.
- Book: *The Everything Guide to Living Off the Grid: A Back to Basics Manual for Independent Living*, Terri Reid, 2011.
- Infrared Thermometer
- Hygro Thermometer
- Kill A Watt Meters (3)
- Ruler
- Tape Measure
- Calculator
- Shower Timer



If you are interested in additional energy- and water-saving devices, contact Sarasota County Sustainability at sustainablesarasota@scgov.net or 941-861-9829 to request the following:

- Smart Power Strip
- LED Light Bulbs
- Bathroom Faucet Aerator (1.0gpm)
- Kitchen Faucet Aerator (1.5gpm)
- Low-Flow Showerhead
- Plug Outlet and Light Switch Wall Insulation Gaskets
- Rope Caulk
- Foam Tape

SAFETY CONSIDERATIONS

To understand the energy audit process and all health and safety concerns, read through this entire manual first. Before you conduct your energy audit, make sure you are physically up to inspection tasks. You will need to wear appropriate clothing and safety equipment, including coveralls, gloves, dust mask, and eye protection when necessary. Ladders and step stools must be secured before you use them; get help when needed. Take caution, as crawl spaces can harbor a variety of contaminants, water, animal droppings, and even live critters. Do not enter your crawlspace if it contains sewage. When moving around in your attic, always step on the wood beams (ceiling joists) — never between them. Stepping between joists can disrupt electrical wiring and/or damage ceilings - or cause serious injury to you or others.

Items of particular concern:

- **Asbestos** – can be found around pipes, air ducts, old heating equipment, and in vermiculite insulation. It may look like a light gray or white fibrous material. Asbestos is dangerous, but particularly so when disturbed and the particles become air-borne. Do not touch anything you suspect contains asbestos, and discontinue the audit. The Florida Department of Environmental Protection (DEP) administers an asbestos removal program which is intended to prevent the release of asbestos fibers to the outside air during demolition or renovation activities. See their website for details: www.dep.state.fl.us/air/about_air/pollutants/asbestos.htm.
- **Fiberglass** - use goggles, a dust mask, gloves and long sleeves to protect lungs and skin from irritating particles.
- **Wiring** - Turn off electricity at the breaker before probing for insulation or checking in the vicinity of any wiring. Consult an electrician if you see bare wires or connections not contained within covered boxes.
- **Mold** – Excessive moisture in the home can lead to mold growth. If mold is found during the inspection consult the U.S. Environmental Protection Agency (EPA) pamphlet “[A Guide to Mold, Moisture and Your Home](#)” and seek professional advice.

WHY IS SAVING ENERGY AND WATER IMPORTANT TO SARASOTA COUNTY?

Sarasota County promotes conservation because it saves residents money on their utility bills today; improves local air and water quality; reduces the need for additional expensive power plants and water infrastructure in the future; helps to keep utility rates lower in the future; and it reduces negative human impacts on the environment.

WHAT WILL THE DIY AUDIT KIT DO FOR ME?

In the use of this DIY Audit Kit and Guide, you will learn how the various systems in your home are designed to function together as well as how they are currently operating. You can then make informed decisions about which energy and water efficiency upgrades might be best for your home. You will also learn how proper maintenance can influence not only efficiency, but also longevity of the equipment in your home, which is often expensive to replace. Even small changes can have a significant impact on reducing your monthly utility costs. This guide will even show you how to make sense of your utility bills, so you can get a firmer handle on how your product choices and behaviors influence the bottom line on your bills.

You will be able to save money on your electric and water bills, and at the same time, have a more comfortable and healthier home, while decreasing your impact on the environment. This manual and the items in your kit will show you how.

SECTION 1: ENERGY AUDIT

ABOUT THE DO-IT-YOURSELF ENERGY AUDIT

A Do-It-Yourself Energy Audit is merely a diligent inspection of your home with a focus on finding wasted energy. Once you finish the basic assessment, you will develop a master plan for improvements that will give you the biggest and fastest payback, beginning with simple and low-cost measures you can do yourself right away. The guide will help you determine when a job is probably too big to be a do-it-yourself project, and will recommend hiring a professional for more complicated or specialized work. That determination will be different for everyone, however, based on experience, time and budget.

As you go through the audit, remember to take a whole-house approach. In other words, view your home as an energy *system* with *interdependent* parts. For instance, your cooling system is not just a single piece of equipment, but a *group* of components that delivers cool air throughout your home using a network of ducts. Even a top-of-the-line, energy-efficient unit can waste a lot of energy if the ducts, walls, attic, windows, and doors are not properly sealed and insulated. Taking a whole-house approach will ensure that your audit is thorough and that your home improvement investments are cost effective.

As mentioned in the Introduction, this DIY Audit Kit is designed for those who are ready to dive *in depth* into the technical details of how their home works. It will take significant time to complete and is not meant to be a first step, but rather a tool for the advanced homeowner. If you would rather not go that far right now, there are other low cost options available that will take less time, but still provide valuable information. Here are two alternatives if you prefer to complete a less demanding do-it-yourself survey:

- Florida Power and Light (FPL)'s website offers its customers an Online Home Energy Survey that accesses your home's specific energy use data and asks questions about your behaviors to provide a breakdown of energy use as well as recommendations for savings: www.fpl.com/residential/energy_saving/programs/ohes.shtml
- Sarasota County's Energy Upgrade website offers energy and water saving tips in an easy to use room-by-room format: www.EnergyUpgradeToday.com

This Guide will provide background information on energy and water use and then outline action steps to understand, calculate and ultimately reduce your use. The action steps are separated in blue boxes with reference materials and worksheets included in the Appendices. Electronic versions of the worksheets in the Appendices are available at www.EnergyUpgradeToday.com, under "DIY Audit Kit."

SHOULD YOU HIRE A PROFESSIONAL AUDITOR?

Ultimately, this manual is not meant to be a substitute for a professional energy audit or for commercially installed upgrades. But there are many tasks that even a novice homeowner can easily accomplish, and this manual will focus on those activities.

A professional energy audit comes with a fee, but gives you the notable benefit of an expert's experience and judgment. A major benefit of hiring a professional auditor is that they have specialized testing equipment for

finding air leakage as well as infrared cameras that can detect energy losses quickly. Here are some of the most common professional diagnostic tools:

- **Thermal Imaging** - Measures temperature differences in the building envelope and then creates a visual image of those differences. The images can usually reveal where walls, ceilings or floors are inadequately insulated or where windows and doors aren't well sealed.
- **Blower Door Test** – Measures the overall air leakage of the entire home by depressurizing the home with a large fan and then measuring the airflow into the home. Also used to detect the actual location of leaks (especially when used in conjunction with thermal imaging).
- **Duct Blaster Test** - Measures the total leakage of the duct system in cubic feet per minute and is used to calculate the percent of conditioned air being lost via duct leaks.
- **Duct Flow Test** – Measures airflow from each register using a flow hood. Also used to conduct a “balance test” to determine if the right amount of air is flowing to each room to insure comfort and efficiency.
- **Duct Pressure Pan Test** – Locates leaking ducts using a blower door to de-pressurize the entire home and the duct system. Also used to locate air leaks through outlets, switches and ceiling can lights.

If you are interested in having a professional auditor inspect your home, visit these websites for a list of certified home energy auditors and/or building energy raters in your area:

- Florida Solar Energy Center: https://securedb.fsec.ucf.edu/engauge/engauge_search_rater (Select Florida and enter your zip code to get a list of local certified "building energy raters.")
- Residential Energy Services Network: www.resnet.us/home-energy-audits (Input your zip code; you can choose a "Home Energy Survey" or a "Building Performance Assessment" Please note that this is a national registry, and only those raters who are RESNET members are listed on their website.)
- While not a comprehensive audit, FPL offers a free in-home energy survey, as well as duct testing for a fee (\$30 for the first A/C unit and \$15 for each additional). This may be a good first step before getting a comprehensive home energy audit completed for a full set of quantified recommendations. FPL provides you with a detailed repair report if the ductwork requires repairs and even provides a list of contractors who are qualified to make the repairs. (www.fpl.com/contractor) They also measure insulation and determine your eligibility for their rebates. For details and an appointment, call 1-800-DIAL-FPL (800-342-5375).

UNDERSTANDING THE BASICS OF HOME ENERGY USE

Before we begin the audit, we must understand where the electricity comes from and where it goes, as well as how it's monitored, measured and valued.

WHERE DOES YOUR ENERGY COME FROM?

Florida Power and Light (FPL) provides electricity to half of the state of Florida, including all of Sarasota County, using a mix of fuels such as natural gas, nuclear, coal, oil, and renewable sources like solar and wind. Some energy comes from other sources or is purchased from other utilities.

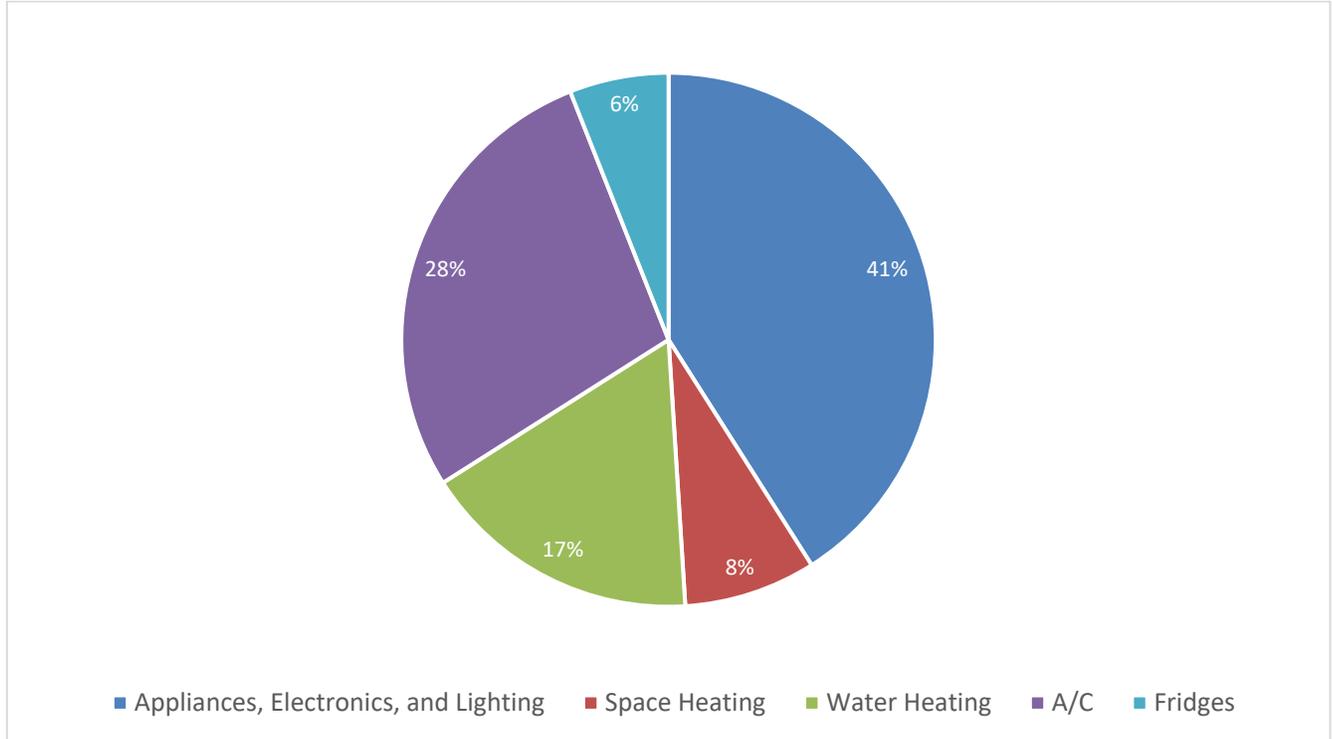
Once the electricity is generated at a power plant, the voltage is “stepped up” and sent out through transmission lines to numerous distribution substations which, in turn, “step down” the voltage for use in that area. Distribution lines then run from the substations out to local communities, and ultimately, to the transformer that serves your home. This transformer “steps down” the voltage one last time to the 120- and 240-volt electricity that can be used in your home. This system of electric distribution is commonly referred to as “the grid.” When you turn something on, energy flows from the grid to your home and you are charged for that energy based on a rate approved by the state.

Electric rates are determined by FPL's costs to buy fuel, generate electricity at the power plant, distribute it to its customers, and maintain their grid. Residential customers are charged for consumption that is measured by meters, which are read each month. What are the meters measuring? Electricity is measured in Kilowatt hours (kWh). Everything in your home that uses electricity requires a certain amount of power, **measured in watts used over a period of time.**

1 kilowatt hour (kWh) = 1,000 watts of electricity used for 1 hour

WHERE DOES THE ENERGY GO?

Average Household Energy Consumption in Florida, 2020



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

More than a quarter of the energy consumed in Florida homes is for air conditioning, which is more than four times the national average. But, the majority of energy goes to appliances, electronics and lighting.¹ Included in that 41 percent are: cooking appliances, clothes washers, dryers, dishwashers, televisions, computers, small electronic devices and lighting. It also includes energy-intensive equipment, such as pool pumps and heaters, spas and well pumps.

While these state-wide averages give a sense of the general breakdown of energy use in Florida, each building and each family is different. Determining specifically *where and how your home uses energy* is vital to controlling your electricity costs, and that is the first step in our evaluation process.

¹ Annual household site end-use consumption in United States homes by state — totals and averages, 2020. <https://www.eia.gov/consumption/residential/data/2020/state/pdf/ce3.1.st.pdf>

PREPARING FOR YOUR ENERGY AUDIT

You can't manage what you don't measure. This guide and the items in your kit will allow you to get a handle on what your own household energy usage is, where your problem areas are, and what steps you can take to reduce consumption and increase comfort. Let's get started!

- First, read through this entire Energy Audit Section to understand the complete energy audit process.
- Collect your FPL bills for the past year (or online, download your Billing History from www.fpl.com. See Appendix A for detailed instructions on how to access and understand your FPL bill.)
- Plan to spend a couple of hours to conduct your inspection. A couple of the steps involve measurements over several days, so start early to allow time to complete all steps before returning your kit to the library.
- Assemble the equipment from your kit:
 1. Ruler to determine insulation depths
 2. Tape measure
 3. Calculator to compute the size of attic and crawl space vents
 4. Kill-A-Watt meter — measures energy consumption of individual equipment
 5. Hygro-Thermometer — measures and tracks humidity and air temperature
 6. IR Thermometer to measure temperature of water and air



- Assemble tools and appropriate clothing:
 - Pen or pencil and this guide
 - Dust mask, eye protection, coveralls and gloves
 - Screwdriver to remove electrical outlet and switch plate covers
 - Plastic knitting needle, wooden chopstick or wood skewer to probe for insulation
 - Incense stick to detect air leaks
 - Flashlight
 - Ladder

- Fill in your Energy Evaluation Worksheet as you go. You can photocopy the worksheet from Appendix B or download an electronic version at www.EnergyUpgradeToday.com, under “DIY Audit Kit.”
- Use the *Energy Savers* booklet in your giveaway bag as a reference. The *Shift Your Habit* and *The Everything Guide to Living Off the Grid* books in the backpack are also useful resources.

ENERGY STEP 1A: UNDERSTANDING YOUR ELECTRIC USE AND BILLING HISTORY

Use the instructions in Appendix A to create or download your electricity Billing and Usage History for the past 12 months. For those with a computer, instructions are provided on how to download your billing history from FPL’s website. For those without a computer, a blank chart is included in Part 4 of Appendix A so you can make a photocopy (remember: this book gets returned to the library for others to use). Whether you use your paper bills, a computer, or the telephone to gather this data, you should end up with a chart that gives you all the information you need. For information on FPL's current electricity rates, check their website at <https://www.fpl.com/rates.html> and look for the "Residential Rates".

BASE LOAD VS HVAC LOAD

Looking at your Billing and Usage History Chart, you've probably noticed that your energy consumption can vary quite a bit from month to month. It typically goes down in the spring/fall seasons and up in the summer/winter seasons. This is due to changing weather conditions and the extra energy required for heating and cooling. The lowest months reveal your **BASE LOAD**, which is the energy used all the time regardless of weather conditions. Base load includes water heating, refrigeration, lighting, entertainment, appliances and miscellaneous items. Depending on your lifestyle and habits, these devices use approximately the same amount of energy most of the time. The difference between the Base Load and your total consumption is the **HEATING AND COOLING (HVAC) LOAD**.

UNUSUALLY HIGH BILLS

Some months, your FPL bill may suddenly be higher than normal. Often, these excessive bills are due to extreme weather conditions or sometimes to unusual occupancy or activity levels in your home. Extreme heat, cold, and humidity may cause your cooling or heating unit to run longer to achieve those normally efficient settings of 68 degrees in the winter and 78 degrees in the summer. If you cannot identify any of those reasons for the increase, you may want to contact FPL to ask for advice or a review of your bill.

THE WORKSHEET

With this foundation of understanding, it is now time to start collecting and analyzing your energy data on the Energy Evaluation Worksheet. For those who are not using a computer, the **Energy Evaluation Worksheet** is **Appendix B**. Make a copy of the worksheet for yourself and enter your data using a pencil in case you want to make changes or corrections.

If you are using a computer, go to www.EnergyUpgradeToday.com, scroll down to "Do-it Yourself Energy and Water Audit Kit" and click on the "More about the DIY kit" dropdown menu. From here, the worksheet is linked under "Energy Evaluation Worksheet". As you enter data on the worksheet, it will automatically make the calculations for you. Be sure to SAVE the document as you complete each step of the worksheet.

ENERGY STEP 1B: DETERMINING YOUR APPROXIMATE BASE LOAD AND HVAC LOAD

Using your electric Billing and Usage Chart from Step 1A, enter your kWh consumption figure for each of the last 12 months in Column 2 of the worksheet. Then, follow the directions on the worksheet for Step 1 to calculate your Base and HVAC Loads. Worksheets being completed electronically will complete these calculations for you automatically. It also allows you to select your starting month from a drop-down menu. For a more detailed look at your specific household energy consumption, check out FPL's Energy Dashboard and Energy Analyzer tools.

ENERGY STEP 2: DETERMINING THE RATE YOU PAY AND THE COSTS OF BASE LOAD VERSUS HVAC LOAD.

To determine your total cost per kilowatt hour (rate), simply divide the total dollar charges by the total number of kilowatt hours. Using the example above:

$$\$1,000.66 \div 11,347 \text{ kWh} = 8.8 \text{ cents per KWh (rounded to 9 cents or $.09 per kWh).}$$

Apply that rate to the annual costs calculations in the Worksheet to determine how much your base load is costing, as well as what you're paying to heat and cool your home — which, incidentally, can be very useful information to have when determining Return on Investment for upgrades you are considering.

Lastly, you can calculate the percentage of your total energy consumption that is attributed solely to heating and cooling. (The electronic worksheet will calculate these for you.)

HOW COSTS ARE CALCULATED

To determine the cost to operate any particular appliance or device in your home, simply multiply the power it uses by the amount of time it runs. Obviously, the greater the power consumption and/or the longer it runs, the higher the cost of operation will be.

For example: A lamp with a 60-watt light bulb left on for 4 hours per day (120 hours per month) will consume 7200 watt-hours per month. Divide by 1000 to get kilowatt hours, then multiply that by your current charge per kWh. You will find that bulb will cost you 65 cents to operate for the month. That same bulb left on for 10 hours a day will cost \$1.62.

$$60 \text{ watts} \times 120 \text{ hours} = 7,200 \text{ watt-hours} \div 1000 = 7.2 \text{ kWh} \times 9 \text{ cents per kWh} = 65 \text{ cents per month}$$

$$60 \text{ watts} \times 300 \text{ hours} = 18,000 \text{ watt-hours} \div 1000 = 18 \text{ kWh} \times 9 \text{ cents per kWh} = \$1.62 \text{ per month}$$

ENERGY FOR HEATING AND COOLING

The pie chart you saw earlier indicated that heating and cooling are the single biggest energy consumers in a typical Florida home — about 36% of annual consumption — so that's where we need to start our search for savings.

Your heating, ventilating and air conditioning (HVAC) equipment is not the only culprit in your energy use equation. Remember, your entire home is a **system** comprised of multiple components that must function efficiently together. Yes, your HVAC equipment moves heat into or out of your home, depending on the season. Since we live in a hot and humid, cooling-dominated climate, for most of the year, you are moving heat *out* of your home. The more heat and humidity that comes into your home, the more the HVAC system needs to run to remove it, and the more you have to pay. Of course in winter, you want to keep heat *in* and the cold *out*.



Reading Recommendation:

***Energy Saver* book in your kit
(*Air Leaks and Insulation*)**

Preventing *unintended* heat transfer requires a hard look at your building envelope, which is simply all the walls, floors, ceilings, doors and windows that enclose your living space. How effectively they separate the interior from the outside elements is what we will investigate next.

Heat moves in three different ways:

- **Convection:** Movement of heat through the migration of air.
- **Conduction:** Movement of heat through solid materials.
- **Radiation:** Movement of heat through space via energy waves (e.g. from the sun)

Air Leaks

We often think of insulation as the primary method of creating an energy-efficient building enclosure. However, reducing air leakage often produces even greater energy savings, and the home is generally much more comfortable once drafts are eliminated too. Air leakage can be responsible for up to 1/3 of the heating and cooling cost, so it's a very good investment to tighten up your home.

Windows and doors are obvious places where air leakage can occur through convection, and even small air

leaks matter! Inspect caulking and weather-stripping around all of the openings in your home for cracks or holes and repair or replace as needed. Also, see if you can rattle your windows and doors (movement means possible air leaks).

Going room-by-room through your home, Energy Step 3 will help walk you through identifying these leaks. You will want to check for holes or cracks around your walls, ceilings, floors, light and plumbing fixtures, switches, and electrical outlets on outside walls — anywhere that can potentially leak air into or out of your home. Also check for air leaks around each HVAC supply and return vent (aka register). Very often the holes cut into the ceiling, walls, or floor to install these grills are not sealed and can be a major source of air leakage. Carefully inspect ventilation exhaust fans, fireplaces, attic access hatches, and pet doors.

Attics are often major problem areas, especially in older homes. Many holes, soffits, can lights, walls and chases which look fine from below are actually open to the attic, allowing easy transfer of air and heat between conditioned and unconditioned spaces. A simple inspection in the attic can reveal many of these problems, and most can be remedied fairly easily by sealing the openings with appropriate materials.

ENERGY STEP 3A: BUILDING ENVELOPE INSPECTION — AIR LEAKAGE INSPECTION

Use the inspection sheet provided in Appendix C as a guide to examine your home for **air leaks** using the techniques outlined below. Be sure to record where they're located and/or mark with painter's tape so that they can be sealed. Then use weather stripping, foam, caulk or any other suitable materials to seal them up when you have time, or bring in a professional to do the work for you.

You can often feel air leaks by simply placing your hand in front of potential leakage spots. Dampening your hand can facilitate this method. If you're having difficulty locating air leaks, a more effective approach may be to conduct a basic building pressurization test:

1. Close all exterior doors, windows, and fireplace flues.
2. Turn off all combustion appliances such as gas-burning furnaces, stoves and water heaters.
3. Turn ON all exhaust fans (generally located in the kitchen and bathrooms) and even the dryer on a "no heat" setting, or you can use a large window fan to draw air *out* of the home.

This will create a small amount of negative pressure in your home - drawing more air from outside to the interior and making the leaks more apparent. You can use an incense stick or your damp hand to locate these leaks. If you use an incense stick, its smoke will waver or swirl, showing air movement. Keep a damp cloth below the burning ash of the stick and stay well away from combustibles. Note any air leaks you discover on the Building Envelope Inspection Sheet (Appendix C) and/or mark those locations with tape (blue painters tape, available in hardware stores, won't leave a mark or residue). As explained earlier, a professional auditor can identify leaks more effectively for you with the use of a blower door test.

If you have a fireplace, use a bright flashlight to check the damper (the metal plate in the chimney above the firebox that regulates the draft). Leaving your fireplace damper open when there is no fire is like leaving your front door wide open. Dampers should be kept tightly closed after a fire is completely out and the fireplace is no longer in use. If you cannot tell if the seal is tight, close the damper on a day when there is a breeze. Hold a

lighted incense stick under the damper; if the flame or smoke sways or moves, the seal is not tight.

For a detailed home air sealing guide with excellent, full-color 'how-to' photos, go to www.energystar.gov and download "A Do-it-Yourself Guide to ENERGY STAR® Home Air Sealing."

INSULATION

Insulation slows conduction — the transfer of heat through building materials — by placing a thermal barrier between conditioned living spaces and unconditioned areas outside the home. Its purpose is to keep heat in during the winter and out during the summer. Insulation products are rated by their ability to **resist heat flow**; this is called **R-value**. The higher the number, the more effective the insulation is. R-values are usually quantified by the inch, and *total* R-value is determined by the type and thickness of the material.

The chart below lists the most common types of insulation, their R-value per inch, and typical installation applications. For more information on determining what type of insulation you have, visit the Department of Energy website: <http://energy.gov/energysaver/articles/insulation-materials>.

Typical Insulation R-values²

Insulation Type	R-value per inch	Typical Applications
Cellulose, loose fill	3.7	Attic Floor
Cellulose, high density	3.2	Walls, Enclosed Cavities, Framing Transitions
Fiberglass, batts*	3.0	Basement Ceiling, Open Stud Walls, Attic Floor
Fiberglass, loose fill	2.8	Attic Floor, Walls (existing)
Fiberglass, loose fill, fluffed below manufacturer's standards	uncertain	Do not install, or correct by blowing over with higher density
Rockwool	3.0	Attic Floor, Walls, Basement Ceiling (may be loose or batts)
Vermiculite	2.7	Attic Floor
Poly-isocyanurate, rigid board	7.0	Foundation Walls, Attic Access Doors
Polystyrene, expanded rigid board	4.0	Foundation Walls, Sill Plate
Polystyrene, extruded rigid board	5.0	Foundation Walls, Sub-Slab, Sill Plate

² Technical Standards for the Building Analyst Professional, Building Performance Institute, <https://www.bpi.org/sites/default/files/Technical%20Standards%20for%20the%20Building%20Analyst%20Professional.pdf>

Low Density Urethane, sprayed foam	3.7	Attics, Walls (new construction); Sill Plate, Band Joist, Framing Transitions
Urethane, sprayed foam	6.0	Attics, Walls (new construction); Sill Plate, Band Joist, Framing Transitions
Urea Formaldehyde Foam	4.0	Attics, Walls (existing)

*NOTE: The values given for Fiberglass, batt are for insulation in excellent condition. If your home has fiberglass batts in the attic that are less than perfect, use this guide to determine its effective R-value:

- Good: R-2.5 per inch (no gaps or other imperfections)
- Fair : R-1.8 per inch (gaps over 2.5% of the insulated area)
- Poor: R - .7 per inch (gaps over 5% Of the insulated area)

ENERGY STEP 3B: BUILDING ENVELOPE INSPECTION — INSPECT AND MEASURE ATTIC INSULATION

Go into the attic and inspect the **insulation**. (Only go into your attic if it is safe to do so, with enough clearance and appropriate protective equipment. Remember to protect your head from roofing nails and wear a breathing mask and appropriate clothing to protect your skin.)

First, identify which type of insulation you have. Then, use your ruler to measure the depth of the insulation at an average spot (see pictures) and multiply the depth by the approximate R-Value per inch of your insulation type (using the values from the chart "Typical Insulation R-Values"). If you notice varying levels of insulation in your home, measure the depth in several places and average them together. You may even see more than one layer or type of insulation, especially in your attic, in which case, you should measure each type/layer and add their R-values together to arrive at the combined insulating value.

Next, take the **infrared thermometer** and walk around inside your home taking the temperature of the *exterior walls and ceilings*. This will help identify locations with temperature variations, which might indicate differing R-values, and possibly missing insulation. Make a note on the Building Envelope Inspection Sheet of any places you find with temperature variations. This is best done when it's hot or cold outside.



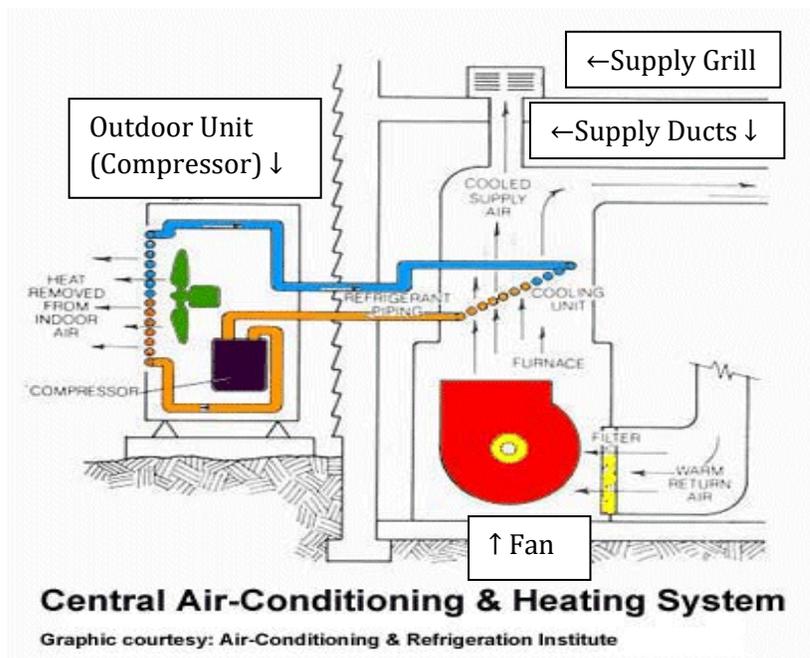


AIR CONDITIONING AND HEATING EQUIPMENT

Once Building Envelope issues have been addressed, the next step is to ensure that your space conditioning equipment is functioning efficiently.

No matter what kind of HVAC system you have, you can save money and increase your comfort by properly maintaining your equipment, following the manufacturer's recommendations. Generally, filters should be changed regularly — every month during periods of high usage (the cooling and heating seasons). Depending upon the number of occupants in your home and whether you have pets, you may even need to change filters more often. You should also have a professional service your equipment at least once a year.

Your HVAC system is actually made up of **FOUR** separate systems: the compressor (outside unit), the air handler (inside unit), the refrigerant loop, and the air distribution (duct) system. They all play an important role in how well the system performs.



You can find excellent and detailed information about the various types of space conditioning systems, how they function and differ, at www.energystar.gov and www.fpl.com. The FPL site is an excellent resource because it is *specific to our climate*, and discusses the pros and cons, as well as costs and benefits of different systems. If you don't use a computer, you can call FPL Customer Service to request a copy of their Heating and Cooling Guide or any of their publications.

Most older Southwest Florida homes have used what's called a "straight cool" air conditioner for cooling, which has electric resistance "strip" heaters in the air handler for the occasions when heating is required during our mild winters. These are like metal toaster coils that get very hot to heat the air as it passes over. They consume a lot of energy though and are usually the culprit if there are high bills in winter.

Most Floridians in newer homes use heat pumps to heat and cool because they are the most efficient form of heating in moderate climates. They are air conditioning systems that can reverse the refrigerant flow to heat the home during the winter — at about half the cost of electric strip heating.

You can determine what type of system you have by placing the HVAC system in heat mode and going outside to see if the outdoor condensing unit is running. If it's running, it's a heat pump. If it's not running, it's a straight cool air conditioner with strip heaters. To learn more specifics about your system, you can refer to your owner's manual or ask your HVAC maintenance company.

Whether you have a straight cool or heat pump system, the size of the unit should be determined by the square footage and thermal efficiency of your home. The standard unit of measure used to describe how much cooling/heating a home needs is the **BTU (British Thermal Unit)**. The cooling capacity of an air conditioner is measured in tons, and **one ton is equal to 12,000 BTU**.

If your equipment is more than 12 years old, you may want to consider replacing it with a higher-efficiency unit. A new system would greatly reduce your energy consumption, especially if the existing equipment is in poor condition. Once again, **FPL's Heating and Cooling Guide** online outlines specifically the typical savings from replacing an existing air conditioner, including annual cooling cost comparisons for different sized homes and A/C units, and operating costs for the different levels of cooling efficiency, known as **SEER (Seasonal Energy Efficiency Ratio)**.

The higher the SEER, the more efficient the unit. It is wise to pay a few extra dollars now to get a more efficient unit because nearly 60% of your electric bill in summer comes from cooling — and electric rates are likely to continue to rise in the future. But remember, any system upgrade must be combined with appropriate maintenance, insulation, air sealing, duct repairs, and thermostat settings. If you use the "whole house" approach, you can cut your energy use for heating and cooling between 20% and 50%.

NOTE: Although most of our space conditioning costs come from cooling, you should also be aware of heating efficiency. **HSPF (Heating Seasonal Performance Factor)** is the



Reading Recommendation:

- **Energy Saver book in your kit (Heating and Cooling)**
- **Energy Upgrade:**
www.EnergyUpgradeToday.com
(Click on Step 4)
- **FPL's Heating and Cooling Guide (1-800-226-5885):**
<https://www.fpl.com/save/pdf/heating-cooling-guide.pdf>

measure of average annual heating efficiency of heat pumps. The higher the HSPF, the more efficient the model. Check out FPL's Heating & Cooling Guide for their most up-to-date SEER and HSPF recommendations

DUCTWORK

According to the U.S. Department of Energy, homes with ductwork in the attic or crawlspace waste between 25-40% of the heating or cooling energy passing through them (<https://www.nrel.gov/docs/fy05osti/30506.pdf>).

This is *money* blowing out of your ductwork and can usually be fixed relatively easily. Inspect your ductwork thoroughly for dirt streaks, especially near seams/joints, which indicate air leaks. These air leaks should be sealed with duct **mastic** (NOT with duct tape which becomes brittle and deteriorates with heat and age). Mastic usually looks white or gray, and is applied over the joints. Check all ductwork runs for any constrictions (crimps) or damage, and verify that all the grills are clean and unobstructed. If your ductwork runs through unconditioned spaces such as an attic or crawlspace, it is exposed to outside climate conditions and should be properly insulated. During your inspection, you should check to be sure all ducts are sealed and insulated to an R-Value of at least 6, the minimum recommended. Determine the type of insulation, its thickness, and refer to the chart to find its R-Value.

NOTE: If you suspect that ducts or pipes are insulated with asbestos, do not touch them! Call a hazardous material professional for an assessment.

ENERGY STEP 4: HVAC SYSTEM INSPECTION

Use the infrared thermometer to first measure the air temperature at the return grill (usually the larger grill near the bottom of the air handler), and then record that temperature on Step 4 of your Energy Evaluation Worksheet.

Next, use the infrared thermometer to measure the air temperature at the supply register (often located in the ceiling) closest to the air handler. Record that temperature on your Energy Evaluation Worksheet. The difference between these two (referred to as the "Delta T") should be between 14–22 degrees.

Next check all of the supply registers (the smaller grills in each room) and see if there are variances among them. Large temperature variations between registers, or a Delta T above or below the 14–22 degree range, may indicate that there are duct leaks, air flow, or other performance problems in that particular line that warrant professional attention for further diagnosis and correction.

Use Appendix D (HVAC Inspection Sheet) as a guide, and record your observations there as you examine the various components of the system and note any work that should be done.



Return Air Temperature Measurements



Supply Air Temperature Measurements

MOISTURE CONTROL

Excessive moisture is a precursor to mold and mildew. The EPA recommends that a healthy and comfortable home have humidity levels between 40–60%. Low humidity can dry out contents and occupants, while too much moisture can be uncomfortable and lead to mold problems. Excessive moisture shows up as mold on walls and/or windows that “sweat.” Moisture commonly enters the home through roof leaks, cracked foundations, uncovered dirt flooring in a crawlspace, blocked gutters, exhaust fans that are vented into the attic, vegetation too close to the house or poor attic or crawl space ventilation. Moisture is also generated

inside the home by cooking, bathing and simply breathing - normal daily household activities.

VENTILATION

Most existing homes in this region have ventilated attics and crawl spaces to allow warm air in the attic to escape to outside. Be sure any vents in soffits and gable ends are clear of debris, insulation and anything else that could impede air flow. Forced venting the attic with a fan can actually do more harm than good by sucking so much air out of the attic that it draws the conditioned air out of the home with it. Forced vented systems must be properly designed and tested to ensure this does not occur.

Many new homes today are built with a sealed attic with no ventilation whatsoever. In these homes, there are no vents in the ridge, soffits, or gable ends — and high R-value insulating foam is sprayed onto the underside of the roof deck, instead of traditional insulation on the attic floor. This technique reduces heat gain to the home below, energy losses from ductwork running through attic spaces, and potential moisture problems in the attic — not to mention, keeping the attic much cooler.

ENERGY STEP 5: CHECKING FOR TEMPERATURE AND HUMIDITY VARIATIONS



Using the Hygro-thermometer in your kit, measure the temperature and humidity in your home. Place the device in different rooms around the home, starting with those rooms that you feel may have comfort or moisture issues first. Leave it in each room for at least 24 hours and record the maximum and minimum temperature and humidity levels on the blank chart provided in Appendix E to determine whether the readings indicate a problem.

At the same time you check the temperature and humidity in each room, also check the A/C thermostat setting and record it on the chart. Anything more than a 3-degree variation from what the temperature is at the main thermostat means there is a potential air flow problem to that part of the home, and this finding warrants further investigation.

Problems may also be occurring as a result of leaky ducts; small ducts (insufficient flow of cooled air); a lot of window area contributing to heat gain; a sunny part of the home (south or west-facing walls/windows that absorb or admit the sun's heat); moisture infiltration from water or air leaks; a combination of these; or possibly other problems. You should check each room — as well as the outside of your home and your attic and crawl space — for possible moisture problems, and note the potential problem on your chart.

You may also want to place the Hygro-Thermometer in the attic one day to see what the maximum and minimum temperature and humidity levels are. You should make a note of the outside weather conditions on the same day (maximum and minimum temperature and humidity levels)

ENERGY FOR YOUR BASE LOAD

Now that you have a handle on the energy being used for heating and cooling (your HVAC Load) it is time to carefully dissect your Base load to learn where improvements can be made.

WATER HEATERS

Heating water for bathing and washing clothes and dishes is typically the second largest single energy expense in your home. The Department of Energy estimates that 14% of Florida household energy use is attributed to water heating (https://www.eia.gov/consumption/residential/reports/2009/state_briefs/pdf/fl.pdf).

There are four ways to cut your water heating bills: use less hot water, turn down the thermostat on your water heater (it should be at 120 degrees F), insulate your pipes, or buy a new, more efficient model (if yours is more than 7 years old). Also, be sure to follow your water heater manufacturer's maintenance instructions.

Thermostat settings are often inaccurate, so measure your water heater's temperature to ensure that it is 120 degrees or less using the infrared thermometer in your kit. This will not only save money, but also reduce the scald hazard from water that's too hot for safe use. First, turn on the hot water at the faucet nearest the water heater. Let it run until hot, then fill up a small bowl with the hot water. Use the infrared thermometer to take the temperature of the water. If it's more than 120 degrees, reduce the thermostat setting then test again the next day using the same method, and continue adjusting until the thermostat is providing an accurate, consistent water temperature.

Also, inspect your water supply pipes; exposed hot and cold water pipes should be insulated, especially the first 6 feet from the water heater. Foam pipe insulation is available for most pipe sizes and is easily installed by do-it-yourselfers.

When purchasing a new water heater, look for ENERGY STAR® certified products and the yellow EnergyGuide label that indicates how much energy it uses per year, as well as how that efficiency level compares to other units. (See Page 29 of your *Energy Savers* book for instructions on how to read the label.) If considering an alternative to traditional tank-style water heaters (such as tankless, heat pump or solar water heaters), plan ahead and research thoroughly the advantages and disadvantages for your situation (size of home, number of occupants, solar orientation, location of unit, and so on).

Both the federal government and Florida Power and Light offer excellent incentives to homeowners for installing solar water heaters, which collect the sun's thermal energy to heat water and can cut a family's water-heating costs by up to 85 percent, according to the Florida Solar Energy Center (FSEC). They come in a wide variety of designs, but all include a collector and storage tank.

Heat pump hot water heaters are also more energy-efficient than their electric or gas alternatives. Heat pump water heaters work by moving the flow of heat to where it is needed, rather than generating heat itself. This heat energy typically comes from the sun (solar-assisted heat pumps), underground (geothermal heat pumps), or the air around it. By redirecting heat rather than conducting it, heat pumps can save households up to 50% off their water-heating costs, according to ENERGY STAR.



Reading Recommendation:

- ***Energy Savers* book (Water Heating)**
- ***FPL Water Heater* webpage:
<https://www.fpl.com/save/resources/water-heaters.html> or call 1-800-226-5885**

- **Federal Tax Credit:** 30% of cost with no upper limit; installation costs included in credit. Expires: December 31, 2032. Details: Existing homes, principal residences and second (vacation) homes all qualify, but rentals do not. (Credit not available for swimming pools or hot tubs.) At least half the energy used for water heating must come from the sun. The system must be certified by the Florida Solar Energy Center (FSEC) or the SRCC. More information: www.energystar.gov, click on TAX CREDITS for details and application.

LIGHTING

Please **use Appendix F** as a guide, and record your observations as you determine the portion of your Base Load coming from your lighting and appliances.

Making lighting improvements is one of the fastest and easiest ways to cut your electric bill. As you gather the information on the numbers of each wattage-size light bulbs you have inside and outside your home, try to estimate the number of hours each is burning daily. This will help when you do Step 6 of your Worksheet.

An average household dedicates 10% of its energy budget to lighting. You may have 100-watt (or larger) bulbs in fixtures where 60 or 75 watts would do. An even better approach is to switch to new lighting technologies, such as **light emitting diodes (LEDs)**, which can reduce lighting energy use in your home by 50-75%.

Advances in lighting controls offer further energy savings by reducing the amount of time lights are on when not in use. Lighting controls include indoor and outdoor applications, such as dimmers, occupancy and motion sensors, timers, and photocells. Study your family's lighting needs and use patterns, paying special attention to high-use areas such as the living/family room, kitchen, and outside lighting. Chances are you'll find many areas that can be improved!



Reading Recommendation:

- **Energy Savers book (Lighting)**
- **FPL Lighting Tips:**
<https://www.fpl.com/save/resources/lighting.html>

APPLIANCES

Appliances account for significant Base Load energy consumption, which can be measured with a KILL-A-WATT Electricity Usage Monitor from your kit. Multiple meters have been included in your kit to allow you to monitor several appliances simultaneously. Instructions for the KILL-A-WATT meters are in Appendix F or online at http://www.p3international.com/manuals/p4400_manual.pdf. The average monthly consumption of any household appliance can be easily estimated using one of the following methods:



- For your refrigerator, and other appliances that run continuously 24/7 all year, measure the consumption for 5 days, and then multiply that figure by 6 to get the average consumption for a 30-day month.
- To measure energy used monthly to wash and dry clothes, measure the consumption for one complete load, then multiply by the average number of loads per month. Follow the same logic for other periodic or occasional-use appliances.

Reading Recommendation:

- *Energy Savers book (Appliances)*
- **FPL Appliance Information:** <https://www.fpl.com/save/resources/appliance-guide.html>
- **ENERGY STAR Appliances:** www.EnergyStar.gov, click on ENERGY STAR Products.

Hundreds of tips for conserving appliance energy use can be found in your Recommended Readings and on the various websites mentioned earlier. But here are a few tips that address several of the most expensive appliances to operate.

- Most of the energy used by clothes washers and dishwashers is from heating the water. Wash only full loads and/or adjust the controls when possible to reflect the size of the load. Wash in cool water whenever possible.
- Clean the lint filter in the clothes dryer after every load to improve air circulation. Periodically inspect your dryer vent exhaust to ensure it's not blocked or crimped (which saves energy, and may also prevent a fire).
- Air dry your dishes rather than using the Heated Dry option.
- Make sure your refrigerator door seals are airtight. Test them by closing the door over a piece of paper or a dollar bill so it is half in and half out. If you can pull the paper out easily, the latch may need adjustment, the seal may need replacing, or you might consider buying a new unit.
- ENERGY STAR® refrigerators are about 10% more energy efficient than models that merely meet the minimum federal standards. By properly recycling your old refrigerator and replacing it with a new ENERGY STAR® -certified model, you can save from \$200 to \$400 over its lifetime.
- When shopping for appliances, remember that there are actually two price tags. The first one covers the purchase price — think of it as a down payment. The second price tag is the cost of operating that appliance during its lifetime. You'll be paying that second price tag every month on your utility bill for the next 10 to 20 years, depending on the appliance. Most energy-efficient appliances have a very short pay-back period.

OTHER HOUSEHOLD EQUIPMENT

Just because the switch says “OFF” doesn't mean the device is not using energy! Many electronic devices continue to draw a small amount of power when they are turned off. These “phantom” loads occur in most electronic devices, such as DVD Players, televisions, stereos, computers, phone chargers, rechargeable batteries, and even kitchen appliances, since many of these items have continuous digital displays or clocks. Even if the device is using a relatively small amount of energy while it is sleeping, these phantom loads consume electricity around the clock, and the cumulative effect is substantial. You can avoid phantom loads by plugging it into a power strip, and then simply turning off the power strip to cut all electricity to the

appliance/device. It's also a good idea to unplug rarely used devices. This not only saves energy, but also reduces the chance that a power surge could damage your equipment.

Many people believe that equipment lasts longer if it's never turned off. This common misconception carries over from the days of older mainframe computers, but it's simply not true for today's devices. If it's not being used, turn it off.

ENERGY STEP 6: FINDING OUT WHERE YOUR BASE LOADS ARE GOING

Water Heating

Your water heater is the largest base load in your home. It is difficult to measure the energy consumed without special 240-volt metering devices, so we'll try to approximate that load using normal household consumption patterns. Assume 20% of **BASE LOAD** for one person and 5% for each additional person in the household. So, a family of two would equal 25% and a family of four would be 35%. By following the equation in Step 6 of the Worksheet, you will be able to calculate your monthly water heating energy use.

Appliances and Electronics

The kit comes with three Kill-A-Watt meters. Plug one into the main television entertainment center, one into the refrigerator (if feasible) and use the third to plug into any other appliance or device you feel may use a lot of electricity. Follow the instructions to make sure the meters are reset after plugging them in, and then record the date and time. Once plugged in, read watts as the equipment is running. This will let you know how much power it uses when it's running. Leave the meter in for 4 to 7 days and read the total kWh consumed. Mark the date and time the reading was taken and divide the kWh consumed by the total number of **days** that have passed. Be sure to use decimal places for better accuracy (i.e. 5.3 days). This will give you kWh per day and from that you can multiply by thirty to get monthly consumption. A few tips:

- Make sure to use a power strip for the TV, cable box, DVD player, etc. so that you are measuring all the devices in your entertainment center. Plug the Kill-A-Watt into the wall and the power strip into the Kill-A-Watt meter.
- To allow for better access, it may be necessary to use a small extension cord between the wall outlet and Kill-A-Watt meter.
- Appliances and devices like computers and entertainment centers that have sporadic and varied run times need to have the Kill-A-Watt meter plugged in longer in order to get average consumption data. Refrigerators only need a few days since their consumption varies little from day to day. For washing machines, coffee pots and other equipment that has a per-use consumption, measure the kWh for each use and multiply that by the estimated number of monthly usages.
- Read the watts and amps drawn by electronic devices in the "off" and/or "standby" mode to measure their "phantom" loads. You may be surprised at the result!



Lighting

For lighting consumption you can use one of two methods, whichever you prefer.

Method 1: Take 10% of your annual consumption (Worksheet Page 1: Column 1 Total) and divide by 12 to get monthly consumption.

Method 2: As outlined on Appendix E, count up the numbers of each wattage-size light bulb inside and outside your home. Then, estimate the number of hours each wattage-size group is burning *cumulatively* each day, and multiply that runtime total by their wattage. Lastly, multiply that daily value by 30 (days in a month) and divide by 1000 for an approximate monthly kilowatt hour usage.
Example:

- (5) 60-watt incandescent bulbs. One runs 15 minutes, two run about an hour and two run about 2 hours a day. This is a total run time of 6 hours and 15 minutes (6.25 hours). So, 6.25 hours per day, times 60 watts, times 30 days and divided by 1000 equals 11.25 kWh per month.
- (6) 20-watt compact fluorescents (CFLs). Two run for an hour, two run for 3 hours and two run for 6 hours. Adding together all the runtimes gives us a total of 20 hours. So, 20 hours per day, times 20 watts, times 30 days, then that total is divided by 1000 and equals 12 kWh per month.
- Add the two bulb totals together for a total of 23.25 kWh per month for lighting. Multiply that by the rate you pay to determine an approximate monthly cost for lighting.

Once you have determined the approximate kWh per month that these individual appliances, electronics, lights and miscellaneous devices are using, subtract it from your monthly Base Load to see what's left. This will consist of other miscellaneous loads like pool pumps, well pumps, compressors, and so on.

Hopefully this guide has helped you to better understand where you are consuming energy, how much these things are costing you, and some areas where you could increase your energy efficiency. Next, let's start formulating a plan to save energy and **MONEY!**

DEVELOPING YOUR ENERGY STRATEGY

Now that you've completed your energy audit, it's time to develop a master plan for improvements. Bear in mind that a good master plan is ongoing, and will typically be implemented over time to help you reach your goals. Here are some additional important elements to consider in your decision-making process:

Payback is an estimate of how long it will take for a particular improvement to save enough energy to pay for itself. Usually, the most cost-effective improvements are those you can do yourself, either for free or for very little cost. You don't have to spend a lot to save a lot! For instance, sealing air leaks is a low-cost item that generally pays for itself in savings in a very short time. Insulation, especially in attics and walls that have little or none, is usually an excellent investment. But paybacks are subjective — meaning, your current situation, budget, and ultimate goals will all have an impact on which improvements are best for you, your family and your home.

Reliable Data is essential. As you research and analyze your list of potential improvements, consider the source of information. Someone selling a product may overestimate the savings of that product or ignore lower-cost measures. Obtaining *unbiased* information from *trustworthy sources*, or engaging the services of a third-party professional with nothing to sell, can help you make the best decisions to reach your goals.

The Whole House approach views your home as an energy *system* with interdependent parts. As you work through the process of developing a prioritized plan for your household, keep in mind the whole house methodology. You will recall the example discussed earlier regarding your cooling system. Even the most energy-efficient HVAC equipment available cannot be effective unless the ducts, walls, attic, windows, and doors are properly sealed and insulated. Taking a whole-house approach ensures that the time and money you invest to save energy are spent wisely.

Prioritizing your energy goals will allow you to make smart home improvements and purchases that save the most money while maximizing energy efficiency. **Appendix H: Improvement Priorities** contains a form designed to help you list all the items that need to be addressed, as well as sort through and prioritize the energy issues that came to light during your home audit. Feel free to create your own list or system that might work better for you. (Using a word-processing program or spreadsheet is an excellent option that will allow you to reprioritize easily.)

To proceed:

- Review your Energy Evaluation Worksheet, and each of your Inspection sheets from the Appendices, taking note of how much you are spending on your HVAC Load and Base Load, and which seem to be your most serious energy concerns.
- On Appendix H: **Improvement Priorities** form, systematically list the items from each worksheet that need to be addressed. This form was designed to help you sort through and prioritize the tasks, but use whatever format works best for you.
- Classify each item as:
 - 1 (Immediate or High Priority)
 - 2 (Necessary but Not Urgent)
 - 3 (Low Priority)
- Classify each item as:
 - DIY (Tasks that you may be able to complete on your own)

- PRO (Tasks that will require a professional — you do not have the expertise or physical ability to complete the task on your own)
- Research the cost of completing each item and estimate the payback time (how long it will take to pay for itself in energy cost savings).
- List any additional benefits from an item that may influence its ranking, for example, increased comfort.
- Before the last step, consider:
 - How long do you plan to own your current home?
 - What is your budget for home energy improvements?
 - How much time do you have to spend on doing these projects?
- Evaluate your list of high-priority projects and organize or number them to indicate the order in which you will complete them.

To help guide you in your analysis, a list of energy and water conservation improvements is provided at the end of the guide in the section titled “Energy and Water Conservation Improvements.” They are arranged in the order of their estimated payback. The list also indicates the items that are provided in the green shopping bag that you may keep.

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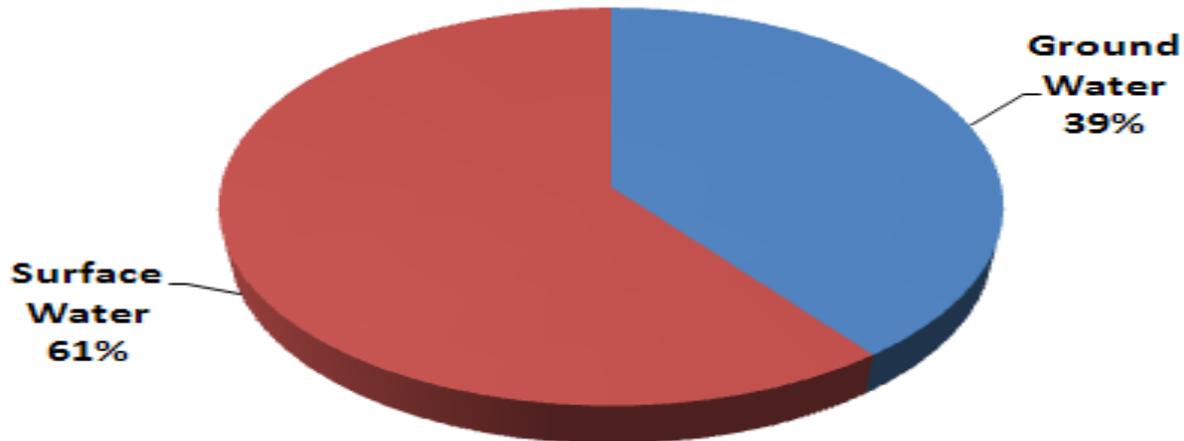
SECTION 2: WATER AUDIT

UNDERSTANDING HOME WATER USE

WHERE DOES YOUR WATER COME FROM AND WHERE DOES IT GO?

Residents in Sarasota County are served by several utilities. These may include Sarasota County, Cities of Sarasota, Venice or North Port or one of several private utility companies or small independent water providers such as those servicing some mobile home parks. For the purposes of this guide, examples and explanations will be provided for customers of the Sarasota County Water Utility. The details of other utility providers may vary in terms of the format of their bills, rate structures and even where they get their water, but the general concepts of water metering, use and conservation strategies will be common no matter who your water utility is. If you have questions about how these concepts apply to your utility, you can find their contact information on your monthly bill.

Sarasota County utilizes several water sources for its drinking water. Sources include wells along University Parkway, in Venice, and on the T. Mabry Carlton Jr. Memorial Reserve, where the water treatment plant is located. These wells, ranging from 400 to 700 feet deep, draw water from the intermediate aquifer and the Floridan aquifer. The use of these sources is overseen by the Southwest Florida Water Management District (SWFWMD) who regulates water supply in Southwest Florida. The percentage of potable water provided by each source in a given year can vary slightly but is generally made up of 39% groundwater and 61% surface water.



Much like the electric grid, our water distribution system is looped and interconnected to improve its reliability and reduce service interruptions. When you turn on a faucet, hose bib or shower, treated

water from our aquifers or rivers flows to your home and you are charged for every one thousand gallons of water that you use.

After you use the water, it flows down the drain and becomes wastewater. The county's wastewater collection system is a network of pipes and lift stations (pumping stations) that deliver the wastewater to one of its wastewater treatment plants. There the wastewater is treated, filtered and processed to produce reclaimed water. The treatment process produces reclaimed water that adheres to strict environmental quality standards, includes chlorine disinfection, continuous monitoring of key parameters and regularly scheduled water quality testing to ensure public safety. Reclaimed water can be used for non-potable water activities such as landscape or outdoor irrigation, cooling tower water and certain commercial gray water systems (e.g., toilet flushing). Reclaimed water is an alternative water resource which allows for the conservation of either groundwater or freshwater supplies. The County's primary goal for its reclaimed water supply is to maximize the beneficial reuse of this resource for irrigation purposes and to limit the amount discharged to deep well or surface water. The cost for wastewater treatment service or reclaimed water supply is based on the amount that you use. Water, wastewater collection, or reclaimed water service maybe available to your home or business depending on where you live.

What water is not reused is either stored or disposed of by deep injection well. The biologic waste from the treatment process or "biosolids" is dewatered and transported for disposal at approved landfills. The cost associated with wastewater treatment service is estimated based on the amount of water you use. Due to the high cost of treating wastewater, the sewer portion of your water bill is much more expensive than the drinking water portion.

UNDERSTANDING YOUR WATER & SEWER BILL

Sometimes, the water and sewer portions of your bill can be confusing. So before we get down to the business of changing water consumption habits, let's first examine how much water and sewer service you use and how you're charged for it. The easiest way to do this is to go through the charges on your bill.

- All water and sewer customers pay a **base charge**, or readiness to serve charge, for water and sewer services. These charges cover the fixed costs of operating the utility, even before you use any water or generate any sewage, including installation and maintenance of the vast underground network of water and sewer pipes that bring water and take away sewage from your home.
- The **billing charge** covers the cost of reading the meters, issuing a bill, postage and other costs associated with billing.
- **Consumption charges** are the fees associated with your usage. You only pay these charges if water or sewer is used. When you conserve water, the usage portion of your bill will go down, especially if you're a big user.

- **Water:** In an effort to promote efficient water use, Sarasota County has adopted Conservation Rates. This means that the more water you use, the higher the billing rate. Water rates are charged per 1,000 gallons with a discounted rate for the first 4,000 gallons. After you've used more than 4,000 gallons of water — between 4,001 and 8,000 gallons a month — you're charged at increasing rates. The first 4,000 gallons are billed from tier one, the next 4,000 from tier two, and so on.
- **Sewer:** Wastewater services are provided at a single rate per 1,000 gallons, but sewer consumption is capped at 10,000 gallons for individually metered residential accounts.

For current water and wastewater rates in Sarasota County, visit:

<https://www.scgov.net/government/public-utilities/customer-services/water-and-sewer-rates>

WATER STEP 1: DETERMINE YOUR HOUSEHOLD WATER/SEWER CONSUMPTION, TIER CHARGES AND SERVICE AVAILABILITY CHARGES.

Collect 12 months of water bills and put the water consumption for each month in column 2 of Appendix G. Note: You can go to www.scgov.net, click on “Pay Water Bill” on the left and log into your account to get your consumption information. If you have not registered for your utility account access on the online system you can use the default PIN printed at the top of your monthly billing statement and follow the online instructions to register. Once you have 12 months of usage information, then, break out how much water was used in each tier.

For Example: In February you used 10,000 gallons of water. 10,000 goes in column 2; 4,000 goes in column 3; 4,000 goes in column 4; and 2,000 goes in column 5.

Once you have all 12 months broken down, add all the columns up and then divide those totals by 1,000. Then multiply by the tier rate to determine how much you spent in each tier throughout the year. Now you can easily determine how much money you can save when you start using less water.

<p> Make One Time Payment</p> <p>Pay your bill in 3 easy steps without registering. All you need is your account number from your paper bill.</p> <p>Payments made prior to midnight will be posted to your account next day. Payments made after midnight will be posted within 48 hours. For each payment, you will receive a confirmation number for your records.</p> <p>Pay Now</p>	<p> Login</p> <p>Email <input type="text" value="someone@example.com"/></p> <p>Password <input type="password" value="Password"/></p> <p>Don't have an account Register Now</p> <p>Login Forgot your password?</p>
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IDENTIFY WATER LEAKS

Now that you understand your bill and how you are charged for the water you consume, let's look at ways to start saving water and money. We'll begin inside the home.

First, we need to determine if anything is leaking. A leaky toilet, for instance, can silently steal hundreds of dollars from your wallet before you even realize you have the leak.

WATER STEP 2: DETERMINE IF YOU HAVE ANY WATER SYSTEM LEAKS.

Turn off all water sources both inside and outside your house, including icemakers, misters, even automatic pool fillers. Grab a large, flathead screwdriver and go outside to the water meter. It's usually a box in the ground with a lid on it in the front yard beside the sidewalk or the road. Use the screwdriver to pry off the lid. Be careful when opening — there could be critters inside. Brush away any dirt and look at the meter.

1. If the small red dial is still spinning **you have a leak. Recheck to be certain you turned everything off.**
2. If the dial is not moving, note its position. Recheck in 1–2 hours. If the dial has moved even a tiny bit, you likely have a **slow leak.**
3. If the dial has not moved when you recheck, **you do not have a leak.**
4. Unsure how to read your meter? Call 861-6790 for assistance.

It is a good idea to perform this check every 4 – 6 months to make sure a leak has not popped-up.

WATER STEP 3: DETERMINE IF YOUR TOILETS ARE LEAKING.

If you requested a Toilet Tank Leak-Detecting Tablet, place one in your toilet tank (if you do not have the tablet, three drops of food coloring will work). Do not flush. Wait 15 minutes. If you see any of that coloring in the toilet bowl, you have a leak and chances are an old or faulty toilet flapper is the cause. (Be sure and flush the toilet after this experiment to avoid staining the tank.) Sometimes it's a quick fix, such as a stuck chain or mineral build up, other times the flapper valve needs to be replaced.

If it needs replacing, you may be able to replace the toilet flapper yourself. Depending on the severity of the leak, you could save a lot of water once the flapper is replaced.

If you hear the toilet's fill tank come on when not in use, that's a sure sign you have a leaky toilet.



HIGH EFFICIENCY WATER FIXTURES

If your house was built before 1994, chances are your faucets and showerheads are not as water efficient as they could be. New high-efficiency showerheads can deliver water below 2.0 gallons per minute, which can save you a lot of water.

WATER STEP 4: DETERMINE THE FLOW RATE OF FAUCETS AND SHOWERHEADS.

Starting in a bathroom, hold the plastic water flow bag from the shopping bag tightly over the end of the sink faucet. Turn on the water to a normal flow for 5 seconds and turn the water off quickly. Examine the bag.

If the bag is filled above the "EPA WaterSense Guideline" mark, chances are you need a new faucet or a high efficiency aerator. Aerators are small screens that screw onto the end of your faucet. They save you money by mixing the water that comes out of your faucet with air. Two faucet aerators have been provided for you in your shopping bag for you to install on older faucets.

Repeat this process with every faucet and showerhead in your home. Some showerheads have the flow rate stamped on the face, so you can look for that instead of testing, or you can test it to verify that it is correct.

Tip: Older faucets tend to gather lime deposits at the end, making it difficult if not impossible to screw on an aerator. To get rid of these deposits, fill a small plastic bag with white vinegar and tie it around the end of the faucet. Leave it on for several hours. When you remove it, the lime deposit should be gone, or at least loose enough to clean away with a brush.



Faucet Aerators



Water Flow Bag

WATER STEP 5: REDUCE THE LENGTH OF YOUR SHOWER

One of the best ways to significantly save water inside your home is to take shorter showers. According to the EPA, pre-1992 shower heads use an average of 5 gallons of water per minute while post-1992 shower heads use an average of 2.5 gallons or less each minute. Since the average shower time in America is 8-minutes, you will save 6–15 gallons of water per shower (depending on your shower head) by cutting your shower time by just three minutes. Shorter showers save more than water. They save energy, too, because you use less hot water from your water heater.



1. Determine the flow rate of your showerhead (*Water Step 4*).
2. Place the shower timer provided in the backpack on the wall in the shower.
3. Take a normal shower and record the length. The timer is set up for 5-minute increments. So, rotate the timer half a turn when the last grains of sand fall to begin another 5-minute interval. Going through the timer twice is a 10-minute shower.
4. Refer to the chart below to understand the implications of various shower lengths on water use.
5. Next time you shower, see if you can shorten the length, ideally to five minutes or less.
6. Repeat this process for every member of your family.
7. When complete, dry the shower timer and place it back in its plastic bag and into the backpack to return to the library.

<u>Pre-1992 Showerhead</u> <u>5 gpm</u>		<u>Post 1992</u> <u>Showerhead</u> <u>2.5 gpm</u>		<u>High Efficiency</u> <u>Showerhead</u> <u>1.5 gpm</u>	
<u>Time</u>	<u>Gallons</u> <u>Used</u>	<u>Time</u>	<u>Gallons</u> <u>Used</u>	<u>Time</u>	<u>Gallons</u> <u>Used</u>
10 min.	50 gallons	10 min.	25 gallons	10 min.	15 gallons
8 min.	45 gallons	8 min.	20 gallons	8 min.	12 gallons
5 min.	25 gallons	5 min.	12.5 gallons	5 min.	7.5 gallons

WATER STEP 6: DETERMINE AGE OF TOILET AND GALLONS PER FLUSH.

Older toilets use a lot more water per flush than newer ones. That’s why many people are replacing old models with new High Efficiency Toilets (HETs). Your water consumption will go down considerably if you do.

Remove the tank lid. Look underneath it for any date stamped on the porcelain. If you don’t find a date there, look inside the tank itself on the back wall just above the waterline. Still no date? Find the make and model and call the manufacturer.

Pre-1982:	5–7 Gallons per Flush
1982–1992:	3.5 Gallons per Flush
After 1992:	1.6 Gallons per Flush

By replacing just one 3.5 gallon per flush toilet with a new 1.6 gallon HET model, a family of four can save approximately 11,096 gallons of water a year. You can also install a flapper-less toilet so you'll save water and never have a flapper valve leak again.

You can convert your current toilet to a dual flush one by installing a kit that you can buy at the hardware store. Dual flush toilets handle waste differently by giving you a choice of flushes — more water for solid waste, less for liquid.

WATER EFFICIENT APPLIANCES

Your clothes washer is another big water user in your home. If you've been thinking about upgrading to a more efficient model, the cost saving per load may be worth it. ENERGY STAR-certified washing machines use 30% less water and 20% less energy compared to conventional top-loading washing machines. This can lead to a lifetime savings of about \$550 in energy and water costs, from switching your washing machine alone!

If you own a clothes washer manufactured before 1998, you'll definitely want to consider buying an ENERGY STAR rated washer. New ENERGY STAR qualified clothes washers use less than a third of the energy — and less than half the water — of other models. These washers use superior designs that require less water to get clothes thoroughly clean. The machines also use sensors to match the hot water needs to the load, preventing energy waste.

And while you're shopping for a new clothes washer, check out the new dish washers, too. According to the Environmental Protection Agency, if your dishwasher was built before 1994, you are wasting more than ten gallons of water per cycle. Remember: try not to rinse your dishes before putting them in the dishwasher. Scrape them and let the dishwasher take care of the rest.

SAVING WATER OUTSIDE YOUR HOME

Up to 50 percent of the water Sarasota County supplies its customers is used outside the home. Of that amount, almost half is wasted by inefficiently watering landscapes. Think about that. **Almost half the water that you use outside your house is wasted.** The good news is that there are some simple steps you can do to begin saving on your outdoor water use.

Start by knowing the outdoor water restrictions in Sarasota County. Sarasota County has instituted once a week watering.

- Watering is prohibited during the day to limit evaporation, so no irrigation is permitted between 10 am and 4 pm on any given day for any properties.
- To report watering violators, please call 861-5000.

TIP:

Low-flow nozzles are the most underrated tool in a homeowner's toolbox. Buy one with a variety of ports so you can use it to spray with force or with a gentle shower. A low-flow nozzle can save a lot of clean water from running into the sewer when you're washing your car at home.

WATER STEP 7: CHECK YOUR IRRIGATION SYSTEM.

Many Florida homes do not have irrigation, as native landscapes and certain types of grasses do not need it once established. If you do have an irrigation system, however, it is important to regularly check to be sure it is working efficiently and effectively. UF/IFAS Sarasota County Extension may offer irrigation audits as part of the Florida Friendly Landscaping Program, so contact the Extension offices at 861-5000 to see if you are eligible. If you would like to test your irrigation system yourself, Put on a raincoat or a poncho and head outside.

Turn on your sprinkler system. Walk around your yard and check to make sure all your sprinkler heads are pointing on the grass. If not, adjust them, or you may want to call a professional.

Now walk your lawn with the system off. Are any sprinkler heads still dribbling or spewing water? If so, the heads may need to be replaced or otherwise fixed.

Also check the timer and make sure you are only watering once a week on your authorized day.

Most irrigation systems have multiple irrigation zones. Are any zones specifically watering well established plants, such as those under eaves of your home or other areas that need less watering? Sometimes those zones can be operated less often or even shut off entirely.

Most automatic irrigation systems have electric timers with a battery backup. Confirm that your battery backup is operational (how to do this may vary by manufacturer so check your owner's manual). Also confirm the default settings that may be used should your system lose power. Some systems default to a two or three day schedule by "default". You may not realize this until you get your monthly water bill if you irrigate with county water.

UNDERGROUND IRRIGATION LEAKS

Underground leaks in your irrigation system can be difficult to find. The best way to tell if you have one is to look for a section of your lawn that stays extremely wet, with water forming puddles or even pools in one spot. If so, this MAY be where the leak is located. We recommend calling a specialist at this point, preferably a member of the Florida Irrigation Society (www.fisstate.org). This indicates the specialist goes to meetings and cares enough about his or her profession to stay up to date on the latest technology. Make sure your specialist is bonded. It also never hurts to ask how long he or she has been in business.

RAIN SENSOR SHUT-OFF DEVICES



Rain sensor shut-off (RSS) devices are an important part of your irrigation system. Whether you irrigate with clean potable water, well water or even reclaimed water, you must have a shutoff device. In May 1991, a Florida Law was passed requiring all irrigation systems to have a functional RSS device installed.

Your RSS device will not work until a pre-determined amount of water falls into it — usually half an inch. Most people think the RSS device will turn their irrigation system off as soon as it starts raining. This is not the case. The cylinder must contain a half inch of water before the RSS signals the controller to shut down the system.

Reading Recommendation:

For more information about Rain Sensors, including how to test them, see: Residential Irrigation System Rainfall Shutoff Devices (<http://edis.ifas.ufl.edu/ae221>)

WATER STEP 7: CLEANING YOUR RSS DEVICE.

In order for your RSS device to work correctly, it must be positioned so that rainfall can enter it easily. Make sure yours is not located under the roofline or covered by shrubbery.

At least once a year you should unscrew the cylinder head and carefully wipe out any dust or debris inside. You should also remove the cork rings, clean them and reinstall. When used properly, rain sensors are a simple, effective way to conserve water.

MICRO-IRRIGATION SYSTEMS

Micro-Irrigation is a watering system that delivers water through small devices called emitters. The water can drip from the emitter, bubble from the emitter or spray/mist from it. Emitters can deliver water from underground near a plant’s roots, or above ground by drip or spray. The feeder tubes and emitters are small and easily covered by mulch or soil. Micro-irrigation systems save water because they’re precise and because there’s less evaporation and runoff than with traditional sprinkler systems. As a result, they are exempt from the one-day a week water restrictions within Sarasota County. Like all irrigation systems, micro-irrigation systems require periodic maintenance to ensure the emitters are clear and free of debris and mineral buildup. For more information see, <http://ufdcimages.uflib.ufl.edu/IR/00/00/42/37/00001/SS43600.pdf>.



RAINWATER HARVESTING

Rainwater harvesting is a fancy term for saving water in a barrel in your backyard when it rains. This water can be used to water plants and vegetables during dry days. And you don't have to buy an expensive cistern either. Some people connect multiple rain barrels to increase their storage capacity. Sarasota County and UF/IFAS Extension have partnered to offer monthly rain barrel workshops where you can learn about rainwater harvesting and purchase a rain barrel for only \$37. Visit www.scgov.net, keyword "Rain Barrel" for more information.



Harvesting rain water can reduce your use of potable water and save you money. Collected water also reduces storm water pollution like sediment, oil, grease, bacteria and nutrients, by diverting runoff away from impervious surfaces such as roofs and driveways.

Check with your landlord, HOA, or neighborhood association first before installing a rain barrel at your home.

FLORIDA-FRIENDLY LANDSCAPING™

The best way to reduce the amount of water used for irrigation in your landscape is to use Florida-Friendly Landscaping™ principles whenever possible. There are scores of native or Florida friendly, drought tolerant, sun-loving plants that will beautify your yard and not be a water hog.

To learn more about Florida-Friendly Landscaping™ principles and find the best plants for your yard, check out the Florida-Friendly Landscaping™ Program at <http://sarasota.ifas.ufl.edu/FYN/fyn.shtml>. They have a Florida Yard recognition program, community classes and workshops,



detailed publications and research-based information to help you through your landscaping decisions.

And remember, grasses and plants can be trained to use less water. When you use less water, you'll force your grass and in-ground plants to grow deeper roots in search of underground moisture.

To learn more about opportunities to save water in your landscaping and irrigation, go to UF/IFAS Extension's Lawn Care and Irrigation Website: <https://livinggreen.ifas.ufl.edu/topics/water/lawn-care-and-irrigation/>

SWIMMING POOL AND SPAS

The number of homeowners with a backyard swimming pool or spa is only expected to grow in the coming years. Thus, pool owners and spa owners need to be mindful of both water and energy savings.

Buy a pool or spa cover if you don't have one already to reduce evaporation. Remember: warmer water evaporates faster than cooler water. Just make sure your pool cover fits properly over the pool.

WATER STEP 10: CHECK YOUR POOL FOR WATER LEAKS.

Set a bucket on the first step of your pool and fill it with water to the same level as the pool. Come back several hours later and check whether the water in the pool is still at the same level as the water in the bucket. If not, you may have a leak. Look through the EPA's Jump Into Pool Water Efficiency guide for more tips on preventing leaks or evaporation from your pool:

<https://www.epa.gov/system/files/documents/2022-09/ws-outdoor-pool-guide.pdf>

DEVELOP A WATER STRATEGY

Now that you've completed a water check both inside and outside your home, it's time to develop a master plan for improvements. Add your water saving opportunities to your Energy Strategy on Appendix H. Then, assign priorities to your water goals, which will allow you to make smart purchases and home improvements that save the most money while maximizing water efficiency. Here are a few questions to ask yourself to begin developing your strategy:

1. How much money do you spend on water?
2. Where are your greatest water losses?
3. How long will it take for an improvement to pay for itself in water cost savings?

4. Do the water-saving measures you're considering provide additional benefits that are important to you? (For example: will a new clothes washer also help you save on energy costs and make clothes washing faster and easier?)
5. How long do you plan to own your current home?
6. Can you do the job yourself or do you need to hire a professional?
7. What is your budget and how much time do you have to spend on maintenance and repair?

A good master plan is ongoing and will typically be implemented over time to help you reach your goals. The best improvements are the ones you can do for free or for very little cost. So stop jiggling the handle on your toilet to make the leak go away and change that leaky flapper instead!

TAKE THE PLEDGE

You don't have to raise your right hand and swear an oath, but it often helps to make commitments as a family to help each other follow through on behavior changes. The pledge below will help outline some easy water-saving steps you all can take to save a precious natural resource.

I acknowledge that water is an increasingly precious natural resource in Florida. I pledge to save at least ten gallons of water per day by following these simple water saving practices:

Pledge	Savings
I will turn on the dishwasher only when full	2 gallons
I will turn off the water when I brush my teeth, wash my face and shave	8 gallons
I will take just one five minute shower a day	5 gallons
I will fix Leaky toilets	30 gallons
I will fix Leaky faucets	15 gallons
I will fill the bathtub only halfway	18 gallons
I will wash only full loads in the washing machine	15 gallons
I will install at least 2 low flow faucet aerators (provided)	14 gallons

I pledge to save at least ten gallons of water per day on my lawn and garden by following these water saving practices outside:

Pledge	Savings
I will plant only native Florida plants in my yard	30 gallons
I will water my lawn and plants in the late evening or early morning and only when necessary	20 gallons
I will reset irrigation controllers and replace batteries in early spring & fall	Up to 250 gallons per cycle
I will adjust sprinklers to prevent overspray and runoff	15 – 25 gallons a day
I will repair leaks and broken sprinkler heads	10 gallons a minute per leak
I will mulch 2 – 3" around trees and plants to prevent evaporation	20 – 30 gallons
I will install a smart controller that automatically shuts off when it rains	40 gallons

ENERGY AND WATER CONSERVATION IMPROVEMENTS

To help guide you in your analysis of opportunities, the following lists of energy- and water-conservation improvements are arranged in the order of their estimated payback. Items that may be requested are indicated with the word "available".

There are also checklists broken down by level of investment (no cost, low cost, moderate cost and investment) with estimated savings numbers included in your bag and available at www.EnergyUpgradeToday.com.

BEHAVIORAL CHANGES THAT ARE FREE AND SAVE A LOT IMMEDIATELY

- (Summer) Set thermostat at 78°F or higher and adjust to 82–83°F when home is unoccupied for extended periods
- (Winter) Set thermostat at 68°F, and lower to 55°F when home is unoccupied
- Turn off ceiling or portable fans in any room that is unoccupied
- Close shades/blinds/curtains to keep heat from the sun out in summer

- Make sure HVAC supply and return grills are not blocked
- Keep the exterior portion of your HVAC unit free of debris and blockages
- Adjust water heater thermostat(s) to 120°F
- Close fireplace damper when fireplace is not in use
- Wash only full loads of dishes, and air dry instead of using your dishwasher's drying cycle
- Take short showers instead of baths (keep your shower under 5 minutes for biggest savings)
- Don't put cleaning tablets in the toilet tank — they can corrode the rubber flapper and cause it to leak
- Turn off the water faucet while brushing your teeth or shaving
- Turn water heater off when leaving home for two or more days
- Wash only full loads of clothes, and use cold water
- Clean your dryer's lint filter after each use to allow it to work more efficiently
- Make sure your dryer exhaust line is tightly connected and not kinked or compressed
- When cooking, match pan size to burner size. Use glass or ceramic pans in the oven. This allows to you to reduce the cooking temperature by 25 degrees and food still cooks just as quickly. Use your microwave instead of the stove whenever possible
- Set refrigerator temperature at 40 degrees, and freezer temperature at 5 degrees
- Plug your electronics into a power strip/ surge protector , and flip one switch to turn them off when not in use. Or use "Smart Power Strips" (available) to enable automatic shut down of peripheral items when the main item is turned off.
 - Computer components: computer, monitor, printer, fax, scanner, router and any other electronic items
 - Entertainment center: home electronics such as TVs, cable boxes and DVD players

LOW-COST IMPROVEMENTS THAT SAVE A LOT IMMEDIATELY:

- Check your HVAC system filters once a month and replace regularly as needed
- Have your HVAC equipment professionally serviced and cleaned at least once a year
- Have your dryer exhaust line cleaned
- Insulate hot water pipes and the first six feet of cold water pipe lines

- Install low-flow, efficient showerheads and faucet aerators (available). Look for the WaterSense® label.
- Repair or replace any leaking faucets. If replacing, look for the WaterSense® label.
- Install insulating gaskets (available) behind electric outlets and switch plates on exterior walls.
- Seal air leaks to attic (and crawl space) with spray foam — especially where plumbing and electrical wiring penetrates walls, floors and ceilings, paying particular attention to recessed lighting fixtures.
- Caulk, seal, or weather-strip any cracks, holes or gaps in and around windows and doors (weatherization materials available).
- Replace door seals on refrigerators and freezers if not tight.

IMPROVEMENTS WITH AN ESTIMATED ONE TO TWO-YEAR PAYBACK

- Install a programmable thermostat
- Have a blower door test conducted to pinpoint location of air leaks that require sealing
- Consider some well placed additions to your landscape to provide shade for sunny walls, windows, and walkways, for instance, deciduous trees, shrubs, a lattice or trellis with climbing vines, etc...
- Add overhangs or awnings to south-facing windows. If designed correctly, they will allow the sun's rays to enter in the winter but block them during the hot summer.
- Add an insulation blanket to the outside of your water heater
- Install light-emitting diode (LED) bulbs (available) in all light fixtures (look for the ENERGY STAR® label)
- Install dimmer switches, photocells, timers and motion sensors where appropriate to reduce lighting energy waste (especially in high-use areas)
- Install an insulated panel/cover to seal your fireplace opening when not in use

IMPROVEMENTS WITH AN ESTIMATED TWO TO FOUR-YEAR PAYBACK

- Install attic insulation to achieve a minimum R-38
- Install insulation under floor/crawlspace to achieve a minimum R-30
- Install fireplace modifications such as glass doors, flue top damper and outside combustion air
- Install window film, solar screens or awnings on east and west-facing windows

- Install wall insulation in un-insulated, wood frame exterior walls
- Install ceiling fans (but remember not to leave them on when you leave the room!)

IMPROVEMENTS WITH AN ESTIMATED FIVE+ YEAR PAYBACK

- Replace existing single-pane and/or leaky windows with new double -pane windows (If you do not have hurricane protection for your windows, consider replacing with energy-efficient and impact-resistant windows.
- Replace older air conditioning system with energy efficient model with a SEER 16 or higher
- Replace an older hot water heater with a newer, more energy efficient model or a gas-fired tankless unit, or a solar water heater.
- When the time comes for replacement, consider a light roof color. Black or dark colored roofs absorb the sun's heat and re-radiate it into your home, so the lighter the color you choose, the better.
- When the time comes for replacement, consider equipment and appliances with the ENERGY STAR® label. ENERGY STAR® products meet strict efficiency guidelines set by the U.S. Department of Energy and the Environmental Protection Agency.

POST AUDIT

After you've completed the audit(s) and made some changes in your home based on what you learned in this guide, consider doing another audit in a few months. Did you find and fix some air leaks? Did you make minor or major improvements, or a combination of both? You may even want to hire a professional auditor to find the next level of savings. At a minimum, review your electric bills in a few months to see whether your investments have paid off in reduced energy bills. Even slight changes in your lifestyle and minor physical improvements to your home can have a significant, positive impact on your energy consumption — resulting in money saved, increased comfort, a healthier home and a more sustainable planet.

When the audit process is completed, please share your thoughts on the program and any suggestions on improvements by emailing sustainablesarasota@scgov.net. Your feedback will help us improve the program.

APPENDIX A — HOW TO READ AND UNDERSTAND YOUR ELECTRIC BILL

PART 1 — FOR COMPUTER USERS

FPL provides an interactive page on its website which allows customers to move the cursor over the highlighted areas and receive detailed information about that section of the bill. Go to:

http://www.fpl.com/customer/how_to_read_your_bill.shtml

But you don't have to wait until your bill arrives to determine your usage. FPL's *Energy Dashboard* online service (<https://www.fpl.com/my-account/residential-dashboard.html#viewResDashboard>) provides customers with key information on how much energy they're using by month. Those with newly installed smart meters will have access to energy use information by day and even by the hour. Here's how to get started:

- Log in to view your account (www.fpl.com). If you don't yet have an online account with FPL, you will need your FPL account number (found on your printed bill), the last four digits of the social security number associated with your account, and an e-mail address to sign up for online access.
- Once you've logged in and have access to your account, click on "**Billing History**" in the left column to see how many kilowatt hours you used each month, the number of service days in each billing period/month, and how much you paid.
- To see your electricity use by the month, day, or hour, click on the "Energy Dashboard" at the top of the web page. By simply hovering over the bars on the graph, you can see: the billing period, bill amount, energy used, and average temperature or humidity for the hour, day, or month.

PRINT OUT YOUR BILLING HISTORY FOR THE PAST 12 MONTHS TO USE FOR THIS AUDIT

PART 2 — IF YOU DO NOT USE A COMPUTER

Look at your paper bill (sample shown on next page) and note the two boxes on the left. The first shows your meter readings and how many kilowatt hours of electricity you used (FPL subtracts the prior month's reading from the current month's reading).

Meter reading - Meter 5CXXXXXX	
Current reading	79065
Previous reading	- 77725
kWh used	1340

The box below it compares that energy use number to what you used in the same month last year. The box also tells you how many days were in the billing period and the number of kWh used per day compared to last year. In this case, usage has decreased since last year from 56 to 43 kWh/day.

Energy usage		
	Last Year	This Year
kWh this month	1620	1340
Service days	29	31
kWh per day	56	43

Amount of your last bill	156.73
Payment received - Thank you	156.73CR
Balance before new charges	\$0.00
New charges (Rate: RS-1 RESIDENTIAL SERVICE)	
Electric service amount	127.35**
Storm charge	1.57
Gross receipts tax	3.31
Franchise Charge	5.95
Utility Tax	9.18
Total new charges	\$147.36

The right side of the bill shows all the extra charges and taxes that are added to your electric service amount, and the total amount of your bill at the bottom. In this case, the total is \$147.36.

To determine your total cost per kilowatt hour, simply divide the "Total New Charges" by the number of kilowatt hours, or look at FPL's current residential rates here: <https://www.fpl.com/rates.html>

At the bottom of the bill, you will find contact numbers for any questions you may have about your bill

Create your own 12-month billing and usage history by using your paper or digital bills to fill in the 4-column chart in Appendix A: Part 4.

Access the Energy Dashboard by TELEPHONE:

You can also get a copy of your last 12 month's billing and usage history by calling **FPL's Energy Expert line at (1-800-342-5375)**.

APPENDIX B — ENERGY EVALUATION WORKSHEET

Energy Evaluation Worksheet
Clear Fields

Step 1: Determining your household consumption and the Base and HVAC load

Column 1	Column 2	Column 3	Column 4
Month	Total Consumption	Base Load: From calculation below	HVAC Load: Total Consumption – Base Load
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
Totals: add all 12			

Base load calculation: Find the two lowest total consumption numbers from column 2. Add them together and divide by 2. This is your approximate Base load. Place that number in each cell in column 3, except the last cell (total cell).

$$\frac{\text{lowest from column 2} + \text{next lowest from column 2}}{2} = \text{total} + 2 = \text{monthly base load for column 3}$$

HVAC Load calculation: For each month, subtract the Base load from total consumption (Column 2 - Column 3). This is the approximate amount of energy used for heating and cooling that month (Column 4). If the number is negative, put it in anyway, you'll need that for your total. Sometimes it can be negative.

Totals: Add all 12 months up in each column. These are the annual usages for each column.

Step 2: Determining your energy costs and where your money is going

Calculate your electricity rate: From your 12-Month Billing and Usage Chart, divide the total \$ Amount of FPL Bills by total KWH Used to determine your electric rate.

$$\frac{\$ \text{total current electric charges}}{\text{kwh consumption}} = \$ \text{rate for electricity (\$/kwh)}$$

Calculating annual costs: Multiply the total consumption values by the electric rate you pay. This is your total annual cost, your annual cost for heating and cooling and your annual cost for base loads.

$$\frac{\text{total from column 2}}{\text{rate}} = \$ \text{total annual cost}$$

$$\frac{\text{total from column 3}}{\text{rate}} = \$ \text{annual cost for base load}$$

$$\frac{\$ \text{annual cost for base load}}{12} = \$ \text{monthly cost for base load}$$

$$\frac{\text{total from column 4}}{\text{rate}} = \$ \text{annual cost for heating and cooling}$$

Calculate the ratio for heating and cooling: Divide the total for HVAC from column 4 by the total annual consumption from column 2. This will give you the percentage of your total usage that goes to heating and cooling the home.

$$\frac{\text{total from column 4}}{\text{total from column 2}} = \text{decimal \#} \times (100) = \text{percent for HVAC}$$

Step 3: Building envelope inspection

Air leakage inspection: Inspect the home for places that can allow air to travel freely from inside the home to outside of the home and write down where those places are.

Inspect and measure the attic insulation: Go into the attic and measure the depth and overall quality of the insulation.

$$\frac{\text{insulation depth in inches}}{\text{effective R-value per inch}} = \text{R-value}$$

Step 4: HVAC system inspection

$$\frac{\text{return temperature}}{\text{supply temperature}} - \frac{\text{supply temperature}}{\text{supply temperature}} = \text{differential temperature} \quad (\text{should be } 14\text{-}22 \text{ degrees})$$

Step 5: Checking for temperature and humidity variations

Use the Hygro-Thermometer to measure temperature and humidity levels throughout the home.

Step 6: Finding out where base loads are going

Water heating: Assume 20% of base load for one person and 5% for each additional person in the household. So, for a family of two it would be 25% and for a family of four it would be 35%.

$$\frac{\text{number of people}}{\text{household \%}} \times 5 + 15 = \frac{\text{household \%}}{\text{decimal \#}} + 100 = \frac{\text{decimal \#}}{\text{monthly base load}} \times \text{monthly base load} = \text{monthly water heating energy}$$

Kill-A-Watt meter usage: Use your Kill-A-Watt meter to determine what individual loads are consuming. Instructions for the Kill-A-Watt meter are in Appendix I and can also be found online at P3 International: www.p3international.com/manuals/p4400_manual.pdf

Refrigerator

$$\frac{\text{date/time read} - \text{date/time installed}}{\# \text{ of days}} \text{ now take } \frac{\text{kwh used}}{\# \text{ of days}} = \frac{\text{kwh per day}}{\text{kwh per day}} \times 30 = \text{kwh per month}$$

Entertainment Center

$$\frac{\text{date/time read} - \text{date/time installed}}{\# \text{ of days}} \text{ now take } \frac{\text{kwh used}}{\# \text{ of days}} = \frac{\text{kwh per day}}{\text{kwh per day}} \times 30 = \text{kwh per month}$$

Other appliance/device:

$$\frac{\text{date/time read} - \text{date/time installed}}{\# \text{ of days}} \text{ now take } \frac{\text{kwh used}}{\# \text{ of days}} = \frac{\text{kwh per day}}{\text{kwh per day}} \times 30 = \text{kwh per month}$$

Other appliance/device:

$$\frac{\text{date/time read} - \text{date/time installed}}{\# \text{ of days}} \text{ now take } \frac{\text{kwh used}}{\# \text{ of days}} = \frac{\text{kwh per day}}{\text{kwh per day}} \times 30 = \text{kwh per month}$$

Other appliance/device:

$$\frac{\text{date/time read} - \text{date/time installed}}{\# \text{ of days}} \text{ now take } \frac{\text{kwh used}}{\# \text{ of days}} = \frac{\text{kwh per day}}{\text{kwh per day}} \times 30 = \text{kwh per month}$$

Once you have determined the approximate kwh per month that these individual appliances and devices are using, subtract it from your monthly base load and see what's left.

Lighting Load: Count the lights (bulbs) in your home and record their wattage. Put them in batches with the same wattage and guesstimate the run time for those lights. Calculate the approximate power used a month for lighting.

$$\frac{\text{Annual consumption}}{\text{Annual consumption}} \times .10 \text{ and then } \div 12 = \frac{\text{kwh per month}}{\text{kwh per month}}$$

OR

$\frac{\text{bulb wattage}}{\text{bulb wattage}} \times \frac{\text{run time per day (hours)}}{\text{run time per day (hours)}} \times 30 \text{ and } + 1000 =$	$\frac{\text{kwh per month}}{\text{kwh per month}}$	}	total lighting load (kwh per month)
$\frac{\text{bulb wattage}}{\text{bulb wattage}} \times \frac{\text{run time per day (hours)}}{\text{run time per day (hours)}} \times 30 \text{ and } + 1000 =$	$\frac{\text{kwh per month}}{\text{kwh per month}}$		
$\frac{\text{bulb wattage}}{\text{bulb wattage}} \times \frac{\text{run time per day (hours)}}{\text{run time per day (hours)}} \times 30 \text{ and } + 1000 =$	$\frac{\text{kwh per month}}{\text{kwh per month}}$		

Once you have determined the approximate kwh per month that these individual appliances and devices are using, subtract it from your monthly base load and see what's left.

Please go to www.EnergyUpgradeToday.com to learn about energy saving strategies in each room of your home.

APPENDIX C — BUILDING ENVELOPE INSPECTION SHEET

BUILDING ENVELOPE INSPECTION SHEET							
Air Leaks — Did you find any air leaks or holes:	Where?						
At any Walls/Ceilings/Floors/Baseboards?							
Around light or plumbing fixtures?							
Around electrical switches or outlets?							
Around HVAC supply or return vents?							
Around exhaust fans or fireplaces?							
Around attic access hatches or recessed light cans?							
Around wall, floor, or ceiling penetrations (plumbing or electrical pipes, ductwork)?							
Around window/wall-mounted air conditioners or pet doors?							
At the joints between different types of construction?							
At joints between different types of construction, especially in attic.							
Windows and Doors	Description						
Number of windows?							
Thickness of windows?	<table style="display: inline-table; border: none;"> <tr> <td style="padding: 0 10px;">Single Pane</td> <td style="padding: 0 10px;">Double Pane</td> <td style="padding: 0 10px;">Triple Pane</td> </tr> <tr> <td style="padding: 0 10px;"></td> <td style="padding: 0 10px; text-align: center;">Storm-rated</td> <td style="padding: 0 10px;"></td> </tr> </table>	Single Pane	Double Pane	Triple Pane		Storm-rated	
Single Pane	Double Pane	Triple Pane					
	Storm-rated						
Any broken latches?							
Did you find window leaks? If so, where?							
Are exterior doors weather-stripped?							
Thresholds and door sweeps at exterior doors?							
Any loose windows, doorknobs or other hardware? (mail slots, etc.)							

Did you find door leaks? If so, where?	
Insulation	Description
Attic insulation type?	Loose Fill / Batts / Styrofoam / Spray Foam
Attic insulation thickness? R-value?	
Wall insulation type?	Loose Fill / Batts / Styrofoam / Spray Foam
Wall insulation thickness? R-value?	
Recessed lights IC rated?	(if not IC rated, make sure no insulation covers these lights!)
Attic	Description
Attic vents, location?	Under Eaves / Gable Ends / On Roof
Number of blocked attic vents? (by insulation, paint, debris, etc.)	
Crawlspace	Description
Vapor barrier under flooring?	
Plastic ground cover (covers every inch of dirt)?	
Crawlspace / floor insulation type?	Loose Fill / Batts / Styrofoam / Spray Foam
Crawlspace / floor insulation thickness? R-value?	
Exterior	Description
How many trees/shrubs provide shade to your home?	

APPENDIX D — HVAC INSPECTION SHEET

HEATING, AIR CONDITIONING AND VENTILATION	
Heating and Cooling System	Description
Type of system?	
Year manufactured?	
SEER? (energy efficiency rating)	
Date filter last changed? Current status?	Date: Status: Clean / Dirty
Date of last system service?	
Daytime temperature setting? (average)	Summer: Winter:
Nighttime temperature setting? (average)	Summer: Winter:
Programmable thermostat?	
If programmable, is it set to reflect when home is occupied and not occupied?	
Do you have any space cooling? If so, how many, where, and hours used?	(e.g., used 20 hours/week in summer)
Do you have any space heating? If so, how many, where, and hours used?	(e.g., used 40 hours/week in winter)
Ductwork	Description
Ductwork insulated?	
Ductwork mastic sealed at seams/joints?	
Did you find duct leaks? If so, where?	
Did you find duct crimps or restrictions?	
Leaks at Supply Vents?	
Supply Vents blocked/sealed? Adjustable?	
Temperature at Supply Vent?	
Leaks at Return Vents?	
Return Vents blocked?	

Temperature at Return Vent?	
Exhaust Fans	Description
Working? (bath, kitchen, attic)	
Vented to exterior? (bath, kitchen)	
Crawlspace	Description
Plastic ground cover (covers every inch of dirt)?	
Number of vent openings around crawlspace perimeter?	
Number of blocked crawlspace vents? (by insulation, debris, etc.)	
Attic	Description
Attic vents, location?	Under Eaves / Gable Ends / On Roof
Number of blocked attic vents? (by insulation, paint, debris, etc.)	

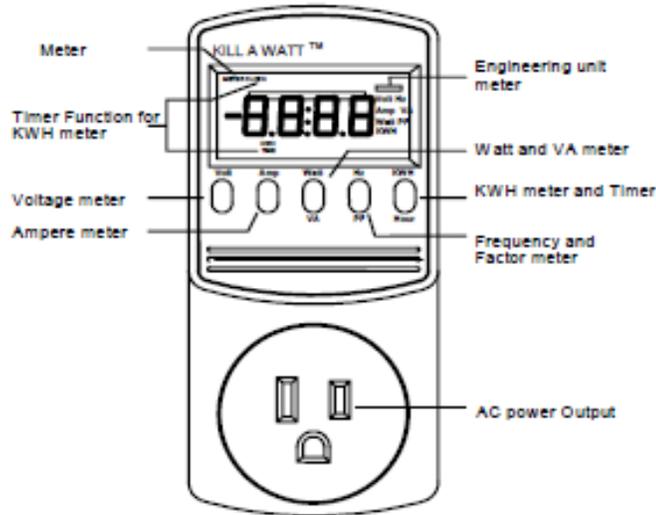
APPENDIX F — APPLIANCES AND LIGHTING INSPECTION SHEET

ELECTRICAL	
Light bulbs	Description
Total number inside and out?	
How many are used for 2 or more hours per day?	
How many are CFL or LED?	
Number of recessed lights?	
Lights turned off when room is empty?	
Timer(s)	Description
How many timers in use (lights, exhaust fans, etc.)?	
Ceiling Fan(s)	Description
How many?	
Turned off when room is empty?	
Photocell(s) and Motion Sensor(s)	Description
How many in use on the interior?	
How many in use on the exterior?	
Refrigerator(s)	Description
How many?	
Type?	Side by side / Bottom Freezer / Top Freezer
Temperature?	
Year manufactured?	
ENERGY STAR® model?	
Date refrigerator coils last cleaned?	
Seal(s) tight?	

Extra freezer(s)? How many?	
Washer and Dryer	Description
Year manufactured? (each)	
Number gallons used by Washer?	
Typical wash temperature?	
Type of Dryer? (heat source)	Electric / Gas
ENERGY STAR® rated? (each)	
Drying rack or clothesline in use?	
Other Equipment	Description
Number of devices plugged in 24/7?	
How often do you turn off devices when leaving the room? (TV, computer, cable box, etc.)?	Always / Sometimes / Rarely / Never

APPENDIX I — OPERATION MANUALS FOR KIT ITEMS

http://www.p3international.com/manuals/p4400_manual.pdf



P4400 Kill A Watt™ Operation Manual

Congratulations on your purchase of the Kill A Watt™ Power Meter. Cared for properly, this unit will provide you with years of service.

1. The LCD shows all meter readings: Volts, Current, Watts, Frequency, Power Factor, and VA. The unit will start to accumulate KWH and powered duration time (hour) after power is applied.
2. Press Volt Key for true RMS Voltage (Volts) display.
3. Press Amp Key for true RMS output current (Amps) display.
4. The Watt/VA Key is a toggle function key. Press the Watt/VA key once to display Watt meter, then press key to display VA meter. The LCD will display Watts as the active power, where VA is the apparent Power. ($VA = V_{rms} \text{ Arms}$)
5. The HZ/PF is a toggle function key. Press the HZ/PF key once to display the frequency (Hertz), then press key to display the Power Factor. HZ is the Frequency of output Voltage, where PF is the Power Factor ($PF = W / v_{rms} \text{ Arms}$).
6. The KWH/Hour is a toggle function key. Press the KWH/Hour key once to show the cumulative energy consumption since power was applied to the unit. Then press key to display the cumulative time since power was applied to the unit.
7. Consumption will be displayed in Kilowatt-Hours (from 0.01 KWH to 9999 KWH). Time will initially be displayed as Hours:Minutes (from 00:00) and switch to Hours (to 9999). Counters will recycle to zero when they reach their maximum. To reset, remove power from unit momentarily.

WARNING: Do not exceed maximum ratings as detailed on label.



Big Digit Hygro-Thermometer

Model 445703 - User Manual



INTRODUCTION

Congratulations on your purchase of Extech's Big Digit Hygro-Thermometer. This professional meter, with proper care, will provide years of safe reliable service.

OPERATION

1. Open the battery compartment by pushing the cover on the rear of the instrument downward as indicated by the arrow. Remove the battery safety strip and the protective cover on the LCD display. The instrument is now ready for use.
2. The temperature units can be selected via the switch located on the rear of the instrument.
3. The upper display indicates the temperature in degrees C or F. The lower display indicates relative humidity in %.
4. Displaying the minimum and maximum values.
 - a. Press the MAX/MIN button. The highest value measured since the Reset button was last pressed appears on the display.
 - b. Press the MAX/MIN button again to display the lowest value measured since the Reset button was last pressed.
 - c. Press the MAX/MIN button again to return to normal display operation.
5. Resetting (clearing) the MAX/MIN memory.
6. Press and hold the RESET button for 1 second while in the MAX/MIN display mode to clear the memory and start recording new max/min values.
7. The unit can be wall-mounted or placed on a flat surface using the foldout footing.
8. The low battery flag will appear on the display when the battery voltage is low. Replace the battery when this occurs.

SPECIFICATIONS

Temperature	-10 to 60°C	±1.0°C within -10°C to 50°C
	14 to 140°F	±1.8°F within 14°F to 122°F
Humidity	10% to 99%	±5% RH within 25% to 85% RH and 0 to 50°C or 32 to 122°F
Battery	One (1) 1.5V 'AAA' cell	
Size / Weight	109 x 99 x 20mm (4.3 x 3.9 x 0.78") / 169g (6 oz.)	

BATTERY REPLACEMENT

Open the battery compartment by sliding the battery cover on the rear of the instrument downward as indicated by the arrow. Replace the 1.5V 'AAA' battery and replace the cover.



You, as the end user, are legally bound (Battery ordinance) to return all used batteries and accumulators; disposal in the household garbage is prohibited!

You can hand over your used batteries / accumulators at collection points in your community or wherever batteries / accumulators are sold!

Disposal: Follow the valid legal stipulations in respect of the disposal of the device at the end of its lifecycle

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