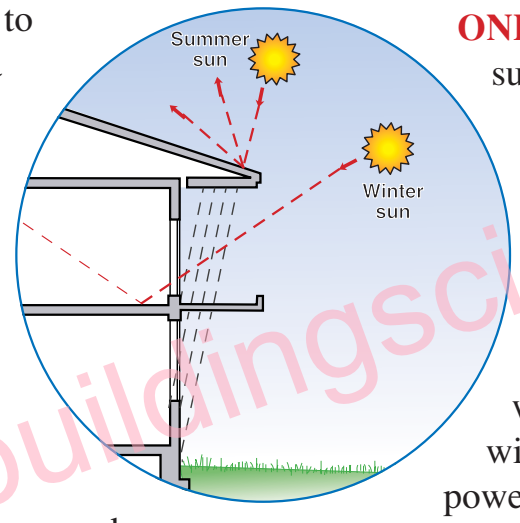
Ultra Low Energy (ULE) Suwanee River Administration Building: Mastering Solar Power Demands

We are so accustomed to ready, virtually unlimited power that most of us don't know just how much it takes to power our buildings and all their conveniences. **ULE** occupants must be students of the Btu[1] and the watt[2].

Managing the Btu We use Btus to talk about heating (welcoming or adding Btus) and cooling (keeping or taking out Btus) the building. A **ULE** occupant negotiates Btus with the sun first, the gas or oil man second. During the heating season, the **ULE** Building and occupant take advantage of the way the home is designed, positioned, and operated to bring as much sun (a free source of Btus) into the building as possible:



- Overhangs and windows – both with dimensions and locations to admit low-angle winter sun.
- Thermal shades – opened or pulled up to admit low-angle winter sun during the day with thermal window shades closed to retain Btus at night.[3]

During the cooling season, the **ULE** Building and occupant take the opposite approach, keeping out as much direct sun (btus) as possible:

- Overhangs and windows – dimensions and locations keep out high-angle direct sun.
- Operable windows and ceiling fans – Relative humidity permitting, free or really cheap cooling can be had by moving air through the building and around occupants.

Lastly, a high-efficiency gas furnace/fireplace provides Btus or supplemental heating during the heating season, with the mechanical ventilation system distributing this heat throughout the house. The high-efficiency air conditioning system provides supplemental cooling and dehumidification for comfort when a breeze from windows and ceiling fans just can't cut it. Both the two-stage compressor and variable-speed, electrically-commutated (ECM) air handler motor are designed for peak efficiency and maximum removal of vapor (latent load) from interior air. Both the furnace and the A/C are controlled by a smart, programmable thermostat, further boosting the HVAC system's efficiency.

Managing the watt We use the watt to talk about electrical power. Being watt-wise is how the **ULE** Building and occupant can really shine, or fade, primarily for two reasons:

1 The **ULE** Building's solar systems—the PV and solar water panels—**ONLY** negotiate with the shining sun. Without any battery storage and only limited hot water tank storage, the **ULE** occupant must match timely supply with timely demand for watts.

2 Moving Btus with watts—heating or cooling with electricity—takes a **lot** of power. Any electrical appliance or home convenience that heats—a toaster, a hair dryer—or cools—primarily the refrigerator—will require the most "watt" diligence.

So, the **ULE** occupant needs to use the following information about types and sources of demand for watts to maximize business with the **ULE** Building's solar systems and minimize (at least incoming) business with the utility. Remember that there are three aspects of any electrical fixture that are important in managing watts—how much power it draws, how long it operates each day, and when it operates each day.

Use these guidelines with the table to the right to manage household energy use:

- Make hay—or coffee or clean clothes or toast—while the sun shines. As much as possible, pace use of significant watt gobblers with your PV system's production.
- Capitalize on your investment in your **ULE** Building with high-efficiency appliances. Use the table below to decide on which items you will get the best return. Use the EPA Energy Star label as a guide.
- Consider every electrical use as a task—on when in use, off when not. This goes for just about everything—lighting, fans, entertainment equipment. As the table shows, they all can draw lots of watts.
- Use fluorescent fixtures and bulbs—the quality and availability has and continues to improve—use the EPA Energy Star label as a guide.
- Watch your "vampire" loads—devices that use energy while plugged in but not functioning. These loads can really add up, particularly for those devices with step-down transformers (adapters) and devices with built-in clocks.
- During the cooling season, manage watts for Btu production, those appliances or fixtures that create heat.

appliance	watts used
coffee maker	900—1,200
clothes washer	350—500
clothes dryer	1,800—5,000
dishwasher (using the drying feature greatly increases energy consumption)	1,200—2,400
ceiling fan	65-175
hair dryer	1,200—1,875
clothes iron	1,000—1,800
microwave oven	750—1,100
Personal computer:	
CPU (awake)	120
monitor (awake)	150
radio (stereo)	400
refrigerator (16 ft^3 frostfree)	725
27" television	113
toaster	800—1,400
vacuum cleaner	1,000—1,400
water pump (deep well)	250—1,100

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1 A British thermal unit (Btu) is the amount of heat energy it takes to raise the temperature of one pound of water by one degree Fahrenheit (at sea level). As an example, it takes about 2,000 Btus to make a pot of coffee.

2 A watt is the basic unit of electrical power. As an example, if you took two 2-liter plastic bottle of soda, one in each arm, and lifted it up three feet in one second over and over again, you would spending the same amount of power as a 40-watt light bulb—tough way to read a book, huh?

3 **A note of caution:** thermal window curtains can **NOT** be used to keep summer sun out during the day because very warm even hot air is trapped between the shade and glazing, possibly creating temperatures high enough to damage the sealed multi-paned glazing units.

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