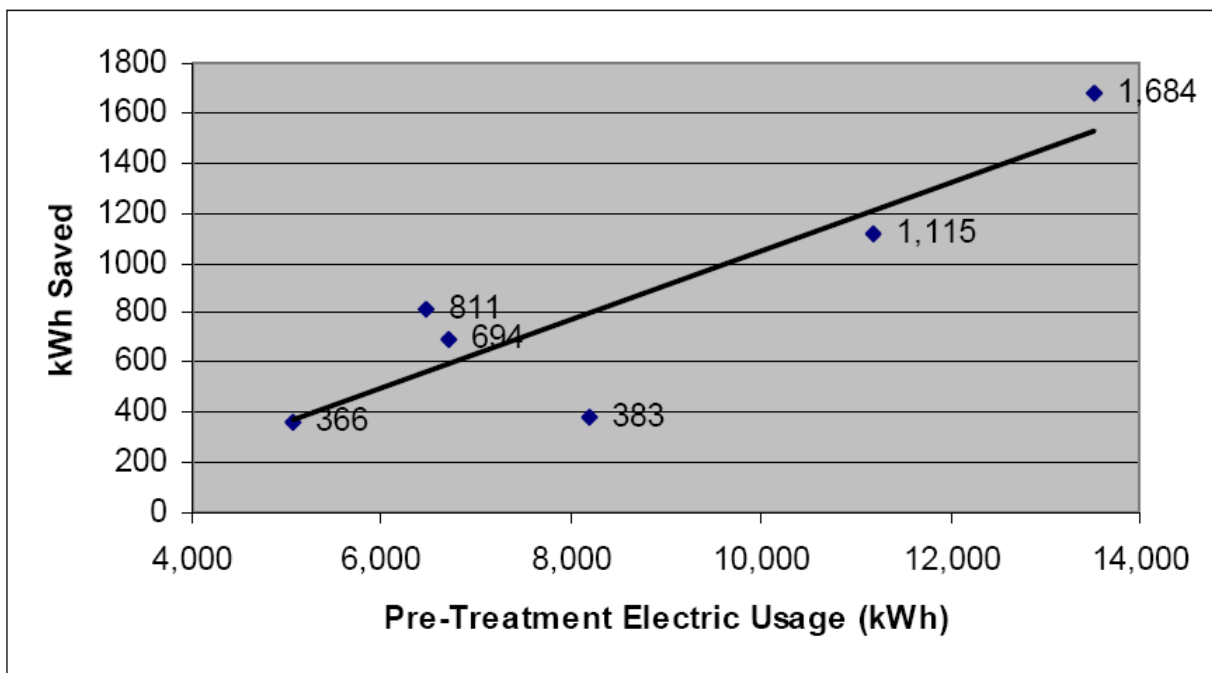


## WHILE PERFORMING WRAP SERVICES, HOW CAN WE BEST FOCUS OUR TIME AND EFFORTS?

### Total electricity use relates directly to potential electricity savings.

Customers who use more electricity tend to save more electricity after weatherization and education, and are therefore, more cost effective to serve. An Energy Auditor/Energy Educator must be able to look at a customer's electricity use and determine if there is opportunity to save electricity. Is enough electricity being used to indicate energy saving opportunities exist?

### Electric Baseload Usage Impacts



Source: David Carroll and Jackie Berger, APPRISE, PA Energy Forum, 2007

### Energy use can be divided into baseload energy use and seasonal energy use.

It is important to understand how to separate baseload use from seasonal use. It is also important to understand how much use is considered *high* use, indicating likely electricity waste, because savings follows waste.

**Baseload use** is electricity used to meet demand independent of season. It powers equipment and appliances that are on all the time and used all year. Baseload does vary throughout the year as lights and water heaters are on more in the winter months and refrigerators, well pumps, and dehumidifiers use more in the summer months. However, these variations account for only about a 10% increase or decrease in baseload use.

**Seasonal use** is electricity used to meet demand over baseload during the cooling and heating seasons. It powers the cooling and heating systems.

In our climate, homes with poor thermal boundaries will likely have high seasonal use. Homes with good thermal boundaries will likely have lower seasonal use, and the total use will be dominated by baseload energy users such as a water heater, appliances, and electronics.

### **Assess the opportunity**

If a customer's *baseload use* is high, savings from implementing baseload measures such as CFL's, refrigerator replacement, and energy education will likely be high. If a customer's baseload use is low, savings from performing baseload measures and education will likely be low.

If a customer's *summer seasonal use* is high and the cause is air conditioning, savings from performing cooling load reduction measures such as window film, insulation or white roof coating, or duct sealing will likely be high. However, if these measures are installed in homes where the cooling load is low, they won't meet the payback requirements required by the PUC and WRAP.

If a customer's *winter seasonal use* is high, and the cause is electric heat, savings from performing heating load reduction measures such as insulation, air sealing, and better thermostats will likely be high. However, if these measures are installed in homes where the heating load is low, they won't meet the PUC or WRAP payback requirements.

**Let's compare the U.S. average with the average PPL customer:**

#### **Top Six Energy Uses for U.S. Households**

<b><i>Electric Energy User</i></b>	<b><i>kWh/yr</i></b>
Heating	2,000 – 10,000
Cooling	600 – 7,000
Water Heating	2,000 – 7,000
Refrigerator	500 – 2,500
Lighting	500 – 2,000
Clothes Dryer	500 – 1,500

*From Saturn Resource Management, Building Analyst Guide, 2007*

## PPL All-Electric Consumption for an Average Customer

<b>Electric Energy User</b>	<b>kWh/yr</b>
Heating	9,100
Cooling	700
Water Heating	3,200
Refrigerator	1,200
Lighting	1,200
Clothes Dryer	1,000
Other	1,200

*From WRAP Standards and Field Guide, page 33*

The average consumption in the chart above gives us data for an average PPL customer – it doesn't tell us if this average customer is wasteful, or practices conservation, or if there are opportunities to increase efficiency.

So, seeing a range of use is may be helpful to the Energy Auditor/Energy Educator to categorize the next WRAP customer. The chart below may help.

### Annual End Use Consumption Ranges (kWh)

<b>Electricity User</b>	<b>LOW</b>	<b>MID</b>	<b>HIGH</b>
<b>Baseload</b>	<b>2250</b>	<b>5000</b>	<b>8000</b>
<b>Domestic Hot Water</b>			
Hot water use, 1-3 people	<b>2500</b>	<b>4500</b>	<b>6000</b>
Hot water use, 3-6 people	<b>4000</b>	<b>6000</b>	<b>8000</b>
<b>Cooling</b>			
Cooling load (total household)	<b>750</b>	<b>1500</b>	<b>2500</b>
<b>Heating</b>			
Electric heat load	<b>2000</b>	<b>5000</b>	<b>8500</b>

*Sources: Updated from John Krigger and Chris Dorsi "Residential Energy: Cost Savings and Comfort for Existing Buildings", Rana Belshe, 2003 and A. Tamasin Sterner, 2005 and 2007*

### **So, where does the Average PPL Customer noted above fall?**

- The Baseload use is 4,600 kWh (Refrigerator, Lighting, Electric Clothes Dryer, Other) so it is in the MID RANGE
- The Electric Water heating use is 3,200 kWh, so it is LOW to MID RANGE depending on the number of people in the house
- The Cooling use is 700 kWh, so it is LOW
- The Heating use is 9,100 kWh so it is HIGH

Pretend this average customer is the one you are going to visit this week. Having looked at the customer's use history prior to visiting the home, where would you plan to focus your efforts in this house? The baseload and heating use is high enough to indicate waste, problems with the appliance, structural defects, or a combination of all three issues. You'd spend your time looking for, and fixing, baseload and heating related problems.

Now, PPL use data doesn't separate water heating use from other baseload use. You can only separate total baseload use from seasonal use. Once you calculate total baseload use, you can look at the WRAP application and see how many people live in the home and also see if the water heater is listed as being electric. If the baseload use is considered high and the water heater is gas, there will be even *more* opportunities for you to reduce baseload use by education and measures such as CFL's and refrigerator replacements. Here is an example:

Let's say you determine the total baseload use is 7,000 kWh annually. If this customer has an electric water heater, they fall into the MID range of use, and you will most likely find something to do to reduce baseload use. However, if that same customer has a gas water heater, they would fall into the HIGH range of use and you will most likely find several things to do to reduce baseload use.

The forgoing implies some general rules for deciding where we should focus our time and efforts:

IF.....

- the baseload, and/or cooling, and/or heating use is LOW, THEN ...
  - focus on the category of use that is in the MID or HIGH range.
- the baseload use (with or without water heating included) is in the MID or HIGH range, there is likely waste or problems with one or more appliances, SO ...
  - be sure to replace incandescent bulbs with CFL's,
  - check all the refrigeration units and replace inefficient units, and
  - do a good job educating the customer about hot water use, and turning off electronics and other plug loads.

- the cooling use is in the MID or HIGH range, consider replacement of AC units, consider window film and white roof coating (or attic insulation), THEN ...
  - check for duct leakage outside the thermal boundary, and
  - do a good job educating about how to follow low-energy cooling strategies.
  
- the heating use is in the MID or HIGH range, CONSIDER ...
  - air sealing and insulation,
  - thermostat change outs,
  - duct sealing if outside the thermal boundary, and
  - do a good job educating about thermostat settings.

Remember: This is just a guide. You won't really know what is going on in the home to determine the energy saving opportunities until you get into the home.

Here is an example of an actual WRAP customer:

## Annual Customer Usage

LANCASTER PA 17603  
 LAN Active 40256S25894 Non Ele HtCool

<i>Bill Date</i>	<i>Billing Days</i>	<i>Tariff Schedule</i>	<i>Reading Source</i>	<i>KWH</i>	<i>KWH/Day</i>	<i>Bill Amount</i>
7/10/2007	32	RSO	Regular Company	2,043	64	\$181.45
6/8/2007	30	RSO	Regular Company	1,134	38	\$107.44
5/9/2007	29	RSO	Regular Company	1,056	36	\$101.09
4/10/2007	32	RSO	Regular Company	1,492	47	\$136.59
3/9/2007	30	RSO	Regular Company	1,972	66	\$175.67
2/7/2007	28	RSO	Regular Company	1,599	57	\$145.30
1/10/2007	33	RSO	Regular Company	1,396	42	\$128.74
12/8/2006	29	RSO	Regular Company	1,194	41	\$112.28
11/9/2006	30	RSO	Regular Company	1,314	44	\$122.05
10/10/2006	29	RSO	Regular Company	892	31	\$87.69
9/11/2006	33	RSO	Regular Company	1,740	53	\$156.71
8/9/2006	29	RSO	Regular Company	2,386	82	\$209.33
<b>Total:</b>				18,218		\$1,664.34

The baseload use:  $(1,134 + 1,056 + 892) \times 1.1 = 3,390$ .  
 3,390 kWh divided by 3 months = 1,130 per month avg. baseload use.  
 1,130 x 12 months = 13,560 kWh/yr = baseload use

$18,218$  (total kWh/yr) –  $13,560$  (total baseload kWh use) =  $4,658$  kWh seasonal use  
 This job technically is considered a Full Cost job because the total seasonal use is over  $3,600$  kWh/yr.

If we separate the summer seasonal use (maybe due to AC use) from the winter seasonal use (may be due to electric heating):

Summer seasonal use is 2,779 kWh (HIGH)  
 Winter seasonal use is 1,879 kWh (LOW)  
 Baseload use is 13,560 kWh (HIGH) (includes electric water heating)

WHERE SHOULD WE FOCUS OUR EFFORTS?

1. Reducing the baseload use, including the hot water use
2. Reducing the summer seasonal use, probably due to AC use