

# REDUCING

# your monthly energy bill

Have you recently found yourself wondering how to lower the monthly energy bill at your home, farm, or ranch? Have you contemplated increased efficiency options or considered offsetting the energy bill by installing a solar photovoltaic (PV) or solar heating system? Thinking through energy efficiency and solar options is a process that should be approached with careful consideration and research. While people have diverse reasons for pursuing efficiency and/or solar options, is it sensible to consider installing a solar array? Capitalizing on efforts to reduce your energy load prior to designing or installing a solar array could optimize the budget and provide a system to value.

Luckily, you can begin reducing energy consumption with minimal cost and effort. First and foremost, establish a reference point of the energy used at your home or operation to measure reduction. This benchmark is called the baseload, and is essentially the summation of all the energy consumed under best possible circumstances.

Determine your baseload when heating and cooling demands are lowest, which is when outside temperatures match comfortable inside temperatures (typically May/June and September/October) and when all other energy consuming habits are normal. Review energy bills from the previous year and choose the two months when consumption was lowest and take the average of those values for all energy/fuel sources reflected in the statement. This will provide a rough idea of baseload consumption.

Now you can determine which months have greater energy use and direct energy reduction efforts toward those times of the year by addressing issues that drive up consumption. This will take some investigating to determine exactly which actions or habits increase energy usage. Simply create a list of how your energy use habits change throughout the seasons and, if possible, quantify the amount of energy consumed by various HVAC appliances, plug loads (things plugged into outlets), etc.

You might tally energy use numbers in kilowatt hours (kWh) or convert to any unit that fits your needs, such as the heating measurement British Thermal Unit (Btu) or Therm. An electricity usage monitor is a great tool for measuring consumption at the plug, and it can be purchased online or from most home supply stores. This type of tool will measure and display the energy being used by that old, inefficient refrigerator in the garage, or the web of cables dangling from your entertainment center, all routing back to the one plug behind the stand.

I recommend that readers should consider having an energy audit performed on a home or operation. Home energy audits should be conducted by competent individuals such as those certified by the Residential Energy Services Network (RESNET) and the Building Performance Institute (BPI). Some utility companies also provide energy audits free to their customers, so check with your energy provider.

When navigating the path toward lowering energy consumption and/or a solar installation, the next step is to implement energy conservation

and efficiency measures. Conservation is simply identifying activities and everyday living habits that consume energy but don't need to. For example, turning off the lights in a room when not in use, using natural ventilation to cool a house instead of air conditioning, or hanging clothes on a line instead of using the dryer are straightforward ways to cut down on energy use. Whether the energy source is electricity, natural gas or propane, simply being frugal with consumption of resources is an easy and smart way to reduce the bill each month.

Energy efficiency, on the other hand, is the process of improving the function of a building while using less energy to get the job done. Efficiency is often accomplished by implementing technologies that don't require changing habits. One example is programming the thermostat to only run that newly purchased, high-efficiency, condensing furnace when the house is occupied, and to turn down the heat at night when your family is asleep. Another example is replacing incandescent bulbs with LED lighting, an easy job that can save 70-80 percent on lighting costs.

When it comes to efficiency in buildings, air seal and properly insulate first. Perform energy upgrades on the structure(s) you spend the most time in, or where the largest percentage of overall energy is consumed. Air sealing can have profound impacts on a home, including reduced energy consumption, better comfort, and improved moisture management. Consider installing ventilation fans that are ducted to the outdoors to remove stagnant, moist air and replace it with fresh, dry, outside air. Although ventilation fans consume a small amount of energy, they help mitigate moisture issues that cause mold, mildew, and respiratory health problems. Ideally, homes are set up with a combination of good air-sealing, ample insulation, and high-quality mechanical ventilation.

The least expensive unit of energy is the one that is never consumed; this idea has been termed as a negawatt when referencing electricity generation. This is an important concept to understand in the transition to a less energy-intensive lifestyle.

Once efficiency measures are implemented in your building(s), you can begin to think about supply-side projects such as installing a solar electric system. This project begins with determining if you have an adequate solar window, calculating the proper orientation, and assessing possible installation locations. Look for more detailed information on a solar site assessment in a future issue of this magazine.

### Further Reading

Power House, 2017. <http://www.powerhousetv.com/Energy-EfficientLiving/EnergyBasics/>. Online source for article and videos related to energy efficiency. Retrieved August 29, 2017. ■

**A**nother metric to determine energy consumption for a home or structure is Energy Use Intensity (EUI), which is the energy use of all fuel sources (see table) for a year in kilo-Btu (kBtu), or Giga Joules (GJ), divided by the size of the building. For example, my home is 1,224 square feet and I determined that I used 72,849 kBtu in 2016, so I calculated the EUI of my house to be around 60 kBtu/ft<sup>2</sup> per year (72,849 /1,224). This number is fairly normal for an older house in a cold, northern climate.

### SAMPLE BTU CONVERSION FACTORS

Energy source/fuel	Physical units and Btu (averages, <sup>1</sup> 2015)
Electricity	1 kilowatthour = 3,412 Btu
Natural gas	1 cubic foot = 1,037 Btu 1 therm = 100,000 Btu
Motor gasoline	1 gallon = 120,476 Btu <sup>2</sup>
Diesel fuel	1 gallon = 137,452 Btu
Heating oil	1 gallon = 138,500 Btu
Propane	1 gallon = 91,333 Btu
Wood	1 cord = 20,000,000 Btu <sup>3</sup>

1. Weighted averages for energy sources/fuels as consumed by end-use sectors.  
2. Gasoline sold at retail in the United States, with about 10% ethanol content by volume.  
3. This conversion is an estimate. A cord of wood is a volume unit and does not take wood density or moisture content into account. Wood heat content varies significantly with moisture content.