



BLUESTEM

ELECTRIC COOPERATIVE INC.

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ENERGY AUDIT GUIDE

PREFACE

High cost is an unfortunate fact in many aspects of modern life. Utility bills, however, do not have to be exorbitant. The size of your electric bill mostly depends on how many appliances you have and how you use them. So, you may take comfort in knowing that at least you can just turn off the switch. Understandably, you probably don't want to take such drastic measures.

With that in mind, Bluestem has provided this information to help you determine exactly why your electric bill maybe high and what changes you can make to reduce the costs and still take care of your household needs. The information contained herein is fairly understandable and will help you conduct your own home audit.

There are many factors to consider when doing a home energy analysis, but given this information, there is no reason why the average person could not do it themselves. If you have any difficulties or questions in the course of your investigation, please call Bluestem Member Services at Wamego 785-456-2212 / Clay Center 785-632-3111 and ask for an energy auditor.

RATES

Bluestem Electric Cooperative, Inc. is a non-profit organization whose main purpose is to supply its members with reliable electric power at competitive rates.

This is being accomplished despite some rather large odds. Bluestem is a rural electric cooperative and that means we only have approximately 2.5 meters or 2½ families per mile of power line. In any electric company the facility costs must be spread among its consumers. The costs are included in the rate base along with other operating costs. Therefore, those 2½ families must share the cost of that mile of power line. Compare this to large investor owned electric companies averaging 33 meters per mile of power line and the municipalities who average far more meters per mile than investor owned, so you can see why cooperatives are at a disadvantage when it comes to rates.

Despite the disadvantages, BEC has stayed competitive. At the present time, BEC's residential rates are slightly higher and our commercial rates are near those of our main competitors. Electric rates can fluctuate several percentage points from month-to-month as the power cost adjustment operates, but the point is, rate differences don't matter much when they are this close.

THE METER

When a member receives a bill that is higher than he/she thinks is reasonable, the meter is usually blamed. We would like to ease your fears that BEC's meter might be inaccurate. The electric meters BEC uses for residential applications are very simple, basic pieces of equipment.

They consist of a cyclometer style register, a polarized disk and a magnet. The disk turns when it is acted upon by the magnetic field created when electricity flows through the meter. A worm gear on the axis of the disk turns the gears that operate the register that shows the kilowatt-hours used. The faster electricity is being used the faster the disk turns. The meters are very accurate because they are calibrated at the factory and any replacement and/or rebuilt meters are calibrated by an independent testing lab located in Hutchinson, Kansas.

BEC's meter test policy is very stringent and requires an independent testing lab to check and adjust all meters to within 2 tenths plus or minus of 100 percent accuracy (which is required by law) before they are put into use.

These tests are done to insure that our members do not pay any more or less than the cost of the electricity they actually use.

"If it's not the meter, what could have made my bill double from one month to the next?" Factors as diverse as the weather and the condition of your water well pump, along with appliance usage and your personal lifestyle, can make a great deal of difference on your bill. We will cover these problem areas, and suggest things you can do to save on your electric usage.

TROUBLE-SHOOTING YOUR ELECTRIC CIRCUITS WITH THE METER

If your electric usage has increased and you have been unable to figure out any lifestyle changes or other unusual uses, the following procedure will help locate sources of trouble, with the aid of your electric meter.

STEP ONE: Turn off the main disconnect. If your meter is on a pole, or pedestal away from the house, the disconnect should be in a box under the meter. If you don't have a main disconnect at the meter, there may be a main breaker in the breaker box inside your home. If not you will need to turn off all of the circuit breakers at once. The disk in the electric meter only turns if electricity is being used. Therefore, the meter should have stopped. If the disk is still turning, check to see that the water pump is turned off at its own fuse or breaker box. Some times a water pump will be wired ahead of the main disconnect for fire protection purposes.

When the water pump has been disconnected and the meter has stopped, you can proceed with trouble-shooting. The idea is to energize as much of your electric wiring system as possible, one circuit at a time and still have a stopped meter disk.

STEP TWO: Turn off the main fuse or breaker in all out buildings, then turn on the main disconnect. If the meter disk is still stopped, this tells you that all outside wiring from the main disconnect to each building's main fuse and water well breakers are OK.

STEP THREE: Proceed by turning on the main breaker or disconnect to the water well. If the meter disk is not turning wait and watch the disk for a few minutes to determine that you do not have a water leak that will cause the pump to operate more. If it stops and starts every few minutes without there being any water usage, then you have a water leak. If the disk turns all of the time while the breaker is on, there could be one of three things wrong. If you have underground wiring going to the well, there could be an underground short in the wiring. Another is that the pressure switch on the pump could be stuck on and the last could be a water leak either in a water line or a leak in the piping in the well. If the meter disk stays stopped with the well breaker on, continue with each individual building by unplugging or turning off everything that uses electricity, then turn on that building's electrical box or main breaker.

To further pinpoint possible trouble, turn on each main fuse or circuit breaker in each building one at a time and then check the meter disk.

Continue this process until one of two things result in the meter disk staying stopped or speeding up. If the disk is still stopped, you're OK. If the disk is turning and the appliances are not on, you have discovered a source of trouble.

Common sources of trouble include electrical faults in the wiring system that is usually due to physical damage such as moisture and dirt, or improper

connections. Sometimes you will find equipment you thought was turned off using electricity, such as an air compressor with a leaky hose, stock waterer thermostat, block heater plugged in, heat tape left plugged in, basement and attic lights or an attic exhaust fan are on.

If you don't find any of these problems, we have test meters available that will record the electrical consumption of the appliance plugged into them. By comparing your recorded use with that on our list for farm and home appliances and equipment, you can determine whether that equipment is using an unusually high amount of electricity.

If these methods fail to locate your problem, contact Bluestem to help you find the problem.

Heating and Cooling Systems

Heating or cooling your home can be the largest part of your electric bill. Remember, your heating and cooling system is probably the largest energy user, other than a water heater and refrigerator, in your home. Even a small difference in the average temperature from one year to another can have a major effect on your electric bill.

USAGE (CONSUMPTION) HISTORY INFORMATION

BEC maintains a record of every member's billing history for three years on our computer system. We can make this available upon request.

This history is very helpful in determining whether or not an increase in your bill is normal or unusually high. With it you can determine when the increase in usage actually occurred, and if it was due to the change in weather conditions. If so, you and we would know.

Comparing the billing dates with the weather change can tell us if an increase may have been due to unusually warm or cold weather and the increase in heating or cooling associated with it.

The usage history report contains the following information arranged in columns.

Rev Mth (Revenue Month): When you pay your bill, the actual usage occurred two months prior to the bill you have just received. For example—your October bill is for usage that occurred mostly in August.

This fact causes many people confusion. You would not expect your October bill to be a large one until you realize that when the usage happened in August, you were still air conditioning. The installation of AMR System meters will enable a timelier bill in the future.

Rev Hist (Revenue History): This is the amount of the bill for electricity and the monthly customer charge. It does not include any amounts carried over from previous bills, taxes, security lights, lightning and surge suppression, which will be included in the total bill.

kWh: Short for “Kilo-watt Hours”, the amount of kilowatt-hours used for this billing period. A kilowatt-hour is a unit measure meaning “1000 watts operating for one hour.” If the wattage of the appliances you are using combined to equal 5000 watts, and if they operate for one hour, the amount of electricity used is 5-kilowatt hours. Conversely if all you are using is one 100-watt light bulb, it must operate for 10 hours to equal one-kilowatt hour.

BEC’s power meters are made to measure kilowatt-hours and that is the unit of measure by which you are billed.

CD: This is the billing code. This column shows different numbers corresponding to footnotes pertaining to that bill. A six (6) in this column means for some reason we were unable to get a meter reading for the first day of the month, the number in the reading column is the result of a computer estimate. A zero (0) in this column means a normal reading and normal billing.

Rdg Dt (Reading Date): This is the actual date the meter was read. To determine the number of days in that billing cycle, look at the reading date for the previous bill and count the days to the next reading. If the billing period is longer than 30 days, the extra days of usage can make a higher than normal bill; but if we are having an unusually hot or cold spring or fall, the extra heating or cooling cost combined with a long billing cycle can make the bill almost double.

Rdg (Reading): This is the actual reading taken on the first day of the month.

VACATIONS & SEASONAL USE

When vacation time comes, and you are planning to be gone for a couple of weeks or so, your electric bill should decrease significantly, right? Wrong!

Many people believe when they leave on vacation, their electric meter stops until they return. If they’re on vacation for two weeks, they expect their electric bill to be cut in half. Let’s ask ourselves a few questions before we assume our electric bill should decrease by any considerable amount during vacation time.

Were the refrigerator and freezer emptied and turned off? If not, they will continue to operate to maintain the preset temperatures.

Take a look at other electrical appliances that keep running while you are on vacation – clocks, attic fans and power ventilators, heating and air-conditioning equipment, lights and TV sets with the “instant on” feature.

If you are determined not to use electricity during your vacation, you can accomplish this by turning off your main breaker or pulling the main disconnect. But remember, when you do this, the automatic appliances and lighting will stop. Your refrigerator and freezer will defrost, your electric water heater will not have hot water ready for use upon your return, and your home may be too hot or too cold when you walk in the door. It’s a decision only you can make. Perhaps you can make arrangements with a neighbor to keep an eye on your place and adjust the heat, water heater and/or air-conditioner shortly before your return.

You may wish to unplug all appliances not in use. If a light is to be left on, it should be connected to a timer that will turn off and on at specific times. Read your meter upon leaving and again when you return. This will let you determine the number of kilowatt-hours used during the period of time you were gone.

Another reminder – many vacationers bring home several days or weeks of dirty laundry. This laundry will give your electric water heater a workout during your first day or two back home, not to mention the clothes dryer will also use a lot of electricity drying all of that laundry.

Only you can decide whether your electric meter gets a vacation or not while you are gone. A vacation conclusion is that your appliances and your electric meter do not go on vacation with you!

Some seasonal uses for electricity that may cause an increase in consumption include: crop dryers; air-conditioners; waterbed heaters; humidifiers; de-humidifiers; portable electric heaters in the bathroom, garage, pump house or basement; engine block heaters to keep your car, truck or tractor ready to run in the winter; stock tank heaters, pet bowl heaters and heat tapes to keep pipes from freezing.

Now let's not overlook hobbies or those businesses that operate from the home! Woodworking tools, ceramic shops with kilns and beauty shops with a number of electric hair dryers, etc, also have an effect on the number of kilowatt-hours you use.

HEATING, VENTILATING AND AIR-CONDITIONING

Heating and cooling costs are usually the biggest part of your energy bill. Estimating what your usage should be takes a fairly in-depth computer program when so many factors affect heating and cooling energy. However, we can generalize and come up with tips on how to keep those summer and winter bills as low as possible.

The heat required to warm your home in the winter and the amount of heat removed in the summer is related to outdoor temperature, the thermal efficiency of your home (insulation), and the temperature you want to maintain in your home (thermostat setting).

Barring any problems with your system, the easiest and quickest way to save money on heating and cooling costs is just to use it less. That means turning up the thermostat a few degrees in the summer and down a few degrees in the winter. We recommend 68 degrees in the winter and 78 in the summer, but cooler and warmer, respectively, would save even more.

There is no reason to heat or cool your home when no one is there to enjoy it. Keeping the system off when you are away can cut a large percentage from your heating and cooling bill. At night when the family is asleep in 2 or 3 rooms, you can use fans or electric blankets to stay comfortable instead of conditioning the whole house.

If you can't remember to adjust the thermostat or if you want the house to be comfortable when you get up or arrive home, an automatic setback thermostat can be programmed to suit your schedule. These thermostats are available at home improvement stores to do it yourself and from heating and air-conditioning contractors.

The efficiency of your heating and cooling system is a major determining factor in how much it will cost to do its job. Even the most efficient system can become an energy waster if it is not maintained properly.

Your heating and cooling system should have some type of filter. We recommend checking it for cleanliness once a month and change or clean it as needed. The filter is easily forgotten. Ninety percent of the homes we visit for energy audits have dirty filters in their HVAC systems. This can increase energy use by 20 percent or more above normal when the system sees a lot of use. If the filter is completely clogged, the airflow will eventually bend it, allowing dirty air to bypass into the cooling coil. As this continues, the coil gathers dust and eventually becomes clogged. This problem is the same as a dirty filter, but harder to fix and will cut the efficiency of the air-conditioner by as much as 70 percent.

Your outdoor unit has a coil too. Potential problems for its coil are similar to the indoor coil problems, only worse. The outdoor coil can collect dirt, grass clippings, dog hair, cottonwood tree fuzz or anything found outdoors small enough to fit between the coil's fins. The fins are thin aluminum and can be bent over very easily, further restricting the airflow.

Monthly filter maintenance and yearly coil inspection and cleaning are easily accomplished by the homeowner and will pay big dividends in energy savings. If you suspect the indoor coil in your system is dirty or if a lot of the fins on the outdoor coil are bent over, a heating and air-conditioning maintenance call is needed.

Another easily forgotten but very important part of your HVAC System is the ductwork. If your system's ductwork is in the attic, it should be checked periodically for leaks. A leak here could increase your bill significantly and make you think the system is not working properly, when in fact it is trying to condition the house and the attic too. Most homes with attic ducts only have ½ inch of duct wrap insulation and should be insulated with 2 inches or more depending on how hot or cold it gets.

This is a worthwhile home improvement with a return on investment usually in less than 3 years. The homeowner can easily accomplish the job with no more tools than duct tape and a shop knife. The insulation should be vinyl-backed fiberglass or other vinyl backed roll insulation, available at most home improvement stores.

Occasionally a HVAC system can have a problem beyond the ability of the homeowner to repair. When it quits completely, there is no doubt about a problem. The time to act is if you notice the system running longer than usual and not heating or cooling as well as it should. This type of problem will increase your electric bill a great deal if not dealt with quickly.

A refrigerant leak is a common cause of high usage, but we have even seen systems malfunctioning so the heating and air-conditioning were working at the same time against each other, causing a very high bill.

The normal efficiency of your heating and cooling equipment can be a factor in high bills also. If your air-conditioner or heat pump is ten years or more old, it probably has a very poor efficiency rating compared to modern systems.

Ten years ago the system may have been the top of the line. It may have done its job all of these years without a whisper. But, the fact is, manufacturers neither had the technology for higher efficiency ratings or the inclination to use it had it been available. Utility rates were much lower, no one cared about depletion of our resources and there just was no real demand for efficient systems at that time.

Efficiency ratings for air-conditioners and heat pumps have doubled over the last fifteen years. New heat pumps can be as much as 350% efficient. That means for every one watt of electricity used, you get 3.5 watts of heat energy for your home. Ratings on gas furnaces have gone from 65% to 95% over the same time period.

In many cases a new, more efficient system is the answer to high bill problems. Since the new high efficiency systems are expensive, we seldom recommend changing your old system until it breaks down, requiring hundreds of dollars to repair or you can see a payback in savings in a few short years with a more efficient system. In this case you can add the repair money to the savings you will see from the new system to make the return on investment for a new system much shorter. If you choose a new air-to-air heat pump or ground source heat pump system, there are rebates available from BEC that will help also.

WHOLE HOUSE INSULATION, CAULKING, FOAM AND WEATHERSTRIPPING

The average household expends 50 to 70 percent of its energy dollars heating and cooling the home. If you really want to significantly reduce your energy bills, reduce the amount of energy required for heating and cooling.

Unless you have recently increased your attic insulation level, this is where you should start. The recommended attic insulation level for homes in Kansas is R-45. That is 12 to 15 inches of depth depending on the type of insulation you buy. We recommend dry blown cellulose, installed at a depth of 14 inches which settles to a depth of 12 inches.

Wall insulation should be an R-13. If you own an older house and aren't sure of its wall insulation level, check behind the electric plates on your outside walls. Sometimes you can see insulation through the crack between the electric box and the sheet rock. If you are sure there is insulation in the wall, it is probably an R-13 or better. While you are there, seal that crack with an outlet foam plate or seal the crack with caulk.

Frame floors should have R-25 insulation blankets installed between the floor joists. Slab floors should have been insulated between the stem wall and the main floor at the time of construction.

These improvements will greatly reduce the amount of heat lost through un-insulated or poorly insulated areas of the home.

Now it's time to stop the air that is infiltrating or exfiltrating your home through cracks in the building envelope. When the wind blows, air infiltrates and when your forced air furnace operates the forced air balloons your home, exfiltrating the air from your home through these same cracks, heating your attic, crawl spaces or the outside world. This is very costly and filling gaps with insulation, foam, caulk or weather stripping is well worth the effort.

Any gap wider than one inch should be insulated, foamed or weather-stripped. Any gap narrower than one inch should be caulked or foamed if possible. Some areas to check are; gaps around doors and window frames, leaky windows, gaps at floor-to-wall and ceiling-to-wall joints, any holes in exterior walls for plumbing or electrical outlets, indoor light fixtures and electrical outlets, dryer, range and bathroom vents. The last three vents should be equipped with positive closing vents, as they will stop all air flow through these openings and only open when the equipment is running.

Obviously doing all of this yourself will take time, but each improvement is one you can do with a minimum of cost and a 100% return on investment in usually less than 3 years.

WATER HEATER

Domestic water heating is one of the largest energy users in the home. Usually the only larger costs are home heating and cooling, with the refrigerator coming in third. Water heating for a four-person family can easily cost \$30 per month.

Proper maintenance of the water heater and plumbing system is very important in keeping your electric bill as low as possible. A common cause of excessive water heating cost is a water leak at the water heater, usually at the pressure release valve, or in the home's plumbing system, usually at a faucet. A hot water leak can cause the water heater to run almost constantly. If the water heater runs constantly for a whole billing cycle it could add as much as \$150 to \$200 to your bill depending on its size. The thermostat setting is another very important factor in water heating energy use. Don't set the thermostat any higher than is absolutely necessary, certainly no more than 140 degrees. We recommend 120 degrees, which is sufficient for most household chores.

Water heaters (except super insulated high efficiency tanks) are not very well insulated. If you have a standard tank or an older tank it would save money to install one of the inexpensive water heater insulation blankets available at home improvement stores. Remember to insulate the top of the tank and the bottom if it is resting on a concrete basement floor (insulate with a firm 3-to 4-inch piece of construction grade Styrofoam). Since heat rises, a greater proportion of heat is

lost at the top and the concrete floor will rob heat from the bottom of the heater. While you are at it, insulate both the water lines for the first 3 feet from the heater and the hot line as far as possible with split foam tubing or pipe wrap.

The way to save the most on water heating cost is to simply use less. This means washing clothes in cold water, installing low flow showerheads, taking shorter showers, using the energy saver dishwasher cycle and any other way you can think of to reduce the amount of hot water your family uses. Our recommendation is to install a Lifetime High Efficiency water heater with a time clock that has the capability to turn the heater off for long periods of time when not needed, such as the eight hours that you are sleeping and the eight hours you are at work. Thus the heater would be off two-thirds of the time.

WATER WELL

Barring any problems, water well is a very economical way to supply water to your home. We have discussed some of the problems in troubleshooting your high electric bill, but we will go over those things again.

High electrical usage occurs when the system malfunctions. If there is a water leak somewhere, the pump could be running much more than normal. If the water leak is in the line between a submersible pump and the pressure switch, the pump will be running constantly. This can also occur if the pressure switch sticks on or closed. However it happens, a well pump running 24 hours a day can add \$80 dollars or more to the electric bill per month.

Another common problem is a water logged pressure tank. Normally, the pump runs, pushing water into the pressure tank against the air charge until a preset pressure is reached, at which time the pressure switch turns the pump off. The pressure tank should have the correct air pressure so that the pump will be able to build water pressure in the tank. This way the pump does not have to operate during the whole time you are using water, because you have the tank's pressure to draw from. If the pressure tank has lost its air pressure, it is said to be water logged. The pump must come on as soon as you turn on the faucet and go off only when the faucet is closed, which is an inefficient and expensive way to supply water for your home.

Checking the operation of your water well pump is very easy and worthwhile. Turn off all of the breakers for your home except the breaker to the water well. If the meter still turns, the water well pump is running or there may be a short somewhere in the well electrical system. If you have just been using water, the well should be running. If you haven't been using water for several minutes, the well should be off. If the meter stops, continue to the next step. Open a faucet and let the water run until the well pump kicks on. It will be easy to tell when this happens by watching the meter.

If the well is working properly, the water should run for several minutes, draining the water from the pressure tank, and the pump should kick on, run for a few minutes to recharge the pressure tank and then kick off again. If the faucet is left open the cycle begins again.

If the meter has been running the whole time, there is a problem – probably a leak. If the pump starts as soon as the faucet is opened and stops only when the faucet is closed, you have a problem – probably a water logged pressure tank. If the pump kicks on and off quickly, obviously not running long enough to build any pressure in the tank, the tank is almost water logged – lost almost all of its air pressure. Any of these problems can cause a higher than normal electric bill, not to mention the extra wear and tear on your well pump.

SUMMARY

1. We recommend 12” to 15” of insulation. Cooling and heating uses 50% - 70% of your energy dollar. Improperly insulated homes cause high electrical usages.
2. Reducing water heater temperatures to 120 degrees can save 18% or more on hot water usage.
3. Each degree you raise the thermostat can save 3% - 4% on the cost of operating your air-conditioner. Each degree you lower the thermostat on your furnace in the winter has the same effect.
4. Change air filters monthly. Dirty filters can increase energy use by 20% or more in normal months of usage.
5. Have your air-conditioning unit checked annually. In rare cases, a heating and air-conditioning unit can be working at the same time not only working against each other but also greatly increasing your electric bills.
6. Ceiling fans help circulate the air. Operating a fan for 8 hours a day costs about \$1.50 a day. If you don't have ceiling fans, the investment may be well worth it.
7. Insulating, caulking, foam and weather stripping are a must to eliminate heat gain and loss.

CONCLUSION

Please remember, problems seldom become large if they are dealt with immediately. For that reason, we hope you will keep this guide handy. It contains all of the knowledge an energy auditor would use if he were to visit your home. With it you can identify and fix a problem before it becomes expensive.

If you have any questions about the information contained herein, or about something you have found while conducting your own Home Energy Audit, please give us a call.