



**BOARD FOR COMMUNITY DEVELOPMENT *through* EDUCATION
GOVERNMENT OF ANDHRA PRADESH**

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HOME ENERGY AUDIT - WORKSHEET

(Compiled by Dr. M.L.S.Deva Kumar Prof of Mech Engg, JNTUA Ananthapuramu)

OBJECTIVES:

- To estimate Energy consumption for a house;
- To understand peak energy consumption pattern;
- To identify ways and means of Energy Conservation;
- To propose action plan for Energy Conservation;
- To measure the savings after implementation of Energy conservation tips.

INTRODUCTION:

Energy is an important commodity in this modern era. As the utility of energy is continuously increasing due to reasons like population growth, increase in usage of electrical equipment, mechanization, enhancement in comfort living requirements etc., The Energy production is not increasing to meet such peak increase in usage of Energy. It is leading to huge gap between Energy Demand and Supply. Hence it is every citizens responsibility to reduce the gap between energy demand and supply by conserving energy as much as possible. In order to implement energy conservation it is necessary to understand the consumption patterns and possible avenues of conservation. Energy Audit is one best way to achieve this.

An energy audit is a way to calculate how much energy being used at home. It will help the citizen to identify how much energy each home uses and where could be saving energy possible. It is the first step to making the home, the school or any other area more energy efficient.

Activity 1: Calculate the Amps and energy used by all of these appliances in one day:

Equation for calculating energy:

- Energy (kWh) = (Power (watts) x time x number of appliances) ÷ 1000

Appliance	Power (W)	Number of appliances	Time used (hour)	Energy (kWh)
Ceiling Fan	80W	2	5	$(80 \times 5 \times 2) \div 1000 = 0.8 \text{ kWh}$
Desktop computer	300W			
LED bulb	10W			
Tube light	40W			
Television	200 W			
Washing Machine	320W			
Microwave	1400W			
Refrigerator	2000W			
Immersion Water Heater	1000W			
Geyser	3000W			

Activity 2: Questions

1. Which were the three appliances that used the most energy? What are they used for ?

2. a) What was the total energy used by all of the appliances (tip – add up all of the energy (kWh) values):

* Note – it is likely that your energy usage may be higher than the calculated value as you may have other appliances that are not included in this table. This worksheet provides an approximate value.

b) Calculate how many kWh of energy are consumed on average in a month (tip - multiply your

total energy used by all appliances by the number of days in the month).

c) Check your electricity bill and compare it to the monthly energy usage that you calculated.

Your total monthly energy usage from your calculation in 2(b)	
Your total monthly energy usage from electricity bill	

An average household in Mumbai city consumes 298kWh of electricity every month and releases about 244kgs of CO₂e (1kWh releases 0.82 kg CO₂e)

3. Write down ideas for reducing energy consumption for appliances in each category:

Device	Ideas to reduce energy
Example: Washing Machine	I could hand wash my clothes some days. Also, I could make sure my family runs bigger loads of washing so that we do not waste water.
Heating and cooling	
Screen-based	
Lighting	** Did you know, switching off a device from the source at plug reduces consumption of electricity by an average of 10%

4. Choose two ways that you will reduce your energy bill by 10. %

CONDUCT SIMILAR STUDY AFTER IMPLEMENTING THE ENERGY CONSERVATION MEASURES AND MONITOR HOW MUCH IS THE SAVING.

5. Comparing electricity bills before and after your energy conservation efforts:

Before:	
After one month:	
Total money saved:	

TOTAL ENERGY SAVINGS FOR THE WARD / VILLAGE AND ALSO REDUCTION IN CARBON EMISSIONS MAY BE CALCULATED AND SUBMITTED TO THE FACULTY MENTOR / WARD / VILLAGE SECRETARY.

THE SAME CAN BE SUBMITTED IN THE FORMAT OF COMMUNITY SERVICE PROJECT AT COLLEGE



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ELECTRICAL ENERGY - SAVING TIPS

(Source: BEE India)

LIGHTING SYSTEM

1. One of the best energy-saving devices in lighting is the switch. Turn off lights when not required.
2. Efficient Fluorescent tube lights such as T5, CFLs and LEDs are much more efficient than incandescent bulbs and can save about 60-80% of electricity for the same lighting levels.
3. Electronic ballasts can reduce power consumption by 20%.
4. Consider employing infrared sensors, motion sensors, automatic timers, dimmers and photocells switches wherever applicable for efficient use. Use outdoor lights with timers or photocells so that they turn off automatically in day light and avoid using curtains during the day.
5. Use task lighting, which focuses light where it is needed. A reading lamp, for example, lights only reading material rather than the whole room.
6. Dirty tube lights and bulbs deliver less light and can absorb about 50 percent of the light; dust tube lights and lamps regularly.
7. Look for BEE rating on the Tubular Fluorescent Lamps.
8. Use artificial lighting only when there is inadequate natural light in a space.
9. Don't replace tube lights (line source) which light over a larger linear spread with a bulb (point source) that emits light from a single point.
10. Don't use dark-colored surface in workrooms. These reduce the reflected light levels and increase the number of lamps required to illuminate the space.
11. Children are advised to study in one room and with individual table lamps and advise them to switch off the individual lamps when not required. Children to utilize morning hours & broad day light for studies rather than using artificial light.
12. Switch off alternate tube Lights/lamps in common areas and staircases during late hours in the night.
13. Please note, a 'Zero Watt' incandescent bulb uses about 10 to 15 watt while an LED bulb of 9 watt can provide light output equivalent to 60 watt incandescent bulb.

CEILING FAN

1. Replace conventional regulators with electronic regulators for ceiling fans.
2. Height of the fan relative to the ceiling. If fan is too close to the ceiling, the airflow is restricted; that is, the fan will not be able to draw as much air through its blade as it has the potential to do. For this reason, 'Hugger' style fans (those which mounted directly to the ceiling without the use of down rod) are all inherently disadvantaged. The distance that a fan should be mounted from the ceiling is directly correlated with its air moving potential; no fan should be mounted with its blade closer than 24 inches to the ceiling.
3. Pitch of the fan's blades. The angle at which the fan's blades tilted relative to X axis is referred to as the blade pitch. The steeper the pitch the greater the air flow.
Since increased pitch also means increased drag, only fans with well made motors can support steep pitches. Cheaply made fans typically have a pitch between 9 and 13 degrees.

AIR CONDITIONER

1. Use BEE star labeled products.
2. Use ceiling or table fan as first line of defense against summer heat. Ceiling fans, for instance, cost about 3 rupees an hour to operate – much less than air conditions (Rs.100 per hour).
3. One will use 3 to 5 per cent less energy for each degree air conditioner is set above 22°C (71.5°F), so far set the thermostat of room air conditioner at 25°C (77°F) to provide the most comfort at the least cost.
4. Reduce air-conditioning energy use by as much as 40 per cent by shading your home as windows and walls. Plant trees and shrubs to keep the day's hottest sun off your house.

5. Using ceiling or room fans allows you to set the thermostat higher because the air movement will cool the room.
6. A good air conditioner will cool and dehumidify a room in about 30 minutes, so use a timer and leave the unit off for some time.
7. Clean the air-conditioner filter every month. A dirty air filter reduces airflow and may damage the unit. Clean filters enable the unit to cool down quickly and use less energy.
8. Have your air conditioning unit checked every 6 months. If the Freon level is not correct, you will waste a lot of energy and your home will never be as cool as you want it.
9. The gaps around the windows and doors leads to A C loss. You can use a candle to look for drafts. If the flame flickers or dances, found the place to seal.
10. Draperies on windows help reduce energy loss.
11. Use electronic devices with occupancy sensors which switch on or off automatically by sensing if the room is occupied.
12. Switch to evaporative coolers from air conditioners during hot/dry summer months.
13. Buy split ACs instead of window ACs. They cost more, but they are more energy efficient and consume lesser electricity.
14. Do not install AC units on the west and south walls as these are exposed to direct sunlight through a major part of the day during summers.
15. Do not apply dark colors on the external surfaces (roof and walls) of the house. Dark colors absorb more heat than light colors, leading to increased use of the AC.
16. Ensure that the condenser of the unit must have enough space around it for air to circulate and help the refrigerant dissipate its heat easily.

REFRIGERATOR

1. Use BEE star labelled products.
2. Keep your refrigerator and freezer at the right temperature. If they are only 2-3 degrees colder than necessary, energy consumption may go up by approx 25%.
3. Make sure the door is sealed tightly. When it's dark, place a lit flashlight inside the refrigerator and close the door. If light around the door is seen, the seals need to be replaced.
4. Make sure that the refrigerator is not placed against outside facing wall or walls exposed to the direct sunlight.
5. Refrigerator motors and compressors generate heat, so allow enough space for continuous airflow around refrigerator. If the heat can't escape, the refrigerator's cooling system will work harder and use more energy.
6. Do not put uncovered liquids in the refrigerator. The liquids give off vapors that add to the compressor workload.
7. Allow hot food to cool off before putting it in the refrigerator.
8. Think about what you need before opening refrigerator door. You'll reduce the amount of time the door remains open.
9. Make sure that refrigerator's rubber door seals are clean and tight. They should hold a slip of paper snugly. If paper slips out easily, replace the door seals.
10. When dust builds up on refrigerator's condenser coils, the motor works harder and uses more electricity. Clean the coils regularly to make sure that air can circulate freely.
11. Defrost freezer compartment regularly for a manual defrost refrigerator.
12. Make sure that you are using a refrigerator that is approximately sized for your needs. If your fridge is too small, you may be overworking. If it is too large, then you are potentially wasting energy and home space.

OVENS / MICROWAVE OVEN

1. Microwaves use around 50% less energy than conventional ovens: they're most efficient for small portions or defrosting.
2. Check the seal on your oven door to see if there are cracks or tears in it.
3. Develop the habit of 'lids-on' cooking to permit lower temperature settings.
4. Carefully measure water used for cooking to avoid having to heat more than is needed.
5. Begin cooking on highest heat until liquid begins to boil. Then lower the heat control settings and allow food

to simmer until fully cooked.

6. Rearrange oven shelves before turning your oven on and don't peep at food in the oven! Every time you open the oven door, 4°-5° is lost
7. When preheating an oven for baking, time the preheat period carefully. Five to eight minutes should be sufficient.
8. For large items, stove-top cooking is most efficient, especially with gas.
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WASHING MACHINES

1. Washing machines can account for as much as 20% of the electricity you use.
2. Use Cold water, as almost 90% of the energy consumed by washing machines goes to heating the water. Set the washing machine temperature to cold or warm and the rinse temperature to cold as often as possible.
3. Each wash cycle uses up to 60 to 90 liters of water. Use washing machine on full load and plan washing periodicity to save on water too.
4. Adding too much detergent actually hampers effective washing action and may require more energy in the form of extra rinses.
5. Wash only full loads of clothing-but do not overload machine. Sort laundry and schedule washes so that a complete job can be done with a few cycles of the machine carrying its full capacity, rather than a greater number of cycle with light loads.
6. Soak or pre-wash the cloths for effective cleaning.

COOKING

1. Organized cooking activity can save about 20% Energy.
2. Use right quantity of water required for cooking and reduce gas / kerosene usage by 65%.
3. Cook on low flame as far as possible and save 6 to 10% energy.
4. The pressure cooker should be loaded 2/3rd of the foodstuff is solid & hard and 1/2 if loaded with liquid. Properly used pressure cookers can save up to 50 to 75% of energy as well as time.
5. Cook your food in solar cooker and save cost of 2 LPG Cylinders annually.
6. When cooking on a gas burner, use moderate flame settings to conserve LPG.
7. Remember that a blue flame means your gas stove is operating efficiently.
8. Yellowish flame is an indicator at the burner need cleaning.
9. Use pressure cooker as much as possible.
10. Use lids to cover the pans while cooking.
11. Bring items taken out of refrigerators (like vegetables, milk etc) to room temperature before placing on the gas stove for heating.

GEYSER / WATER HEATER

1. Install Solar Water Heating System.
2. By reducing the temperature setting of water heater from 60 degrees to 50 degrees C, one could save over 18 percent of the energy used at the higher setting.
3. To help reduce heat loss, always insulate hot water pipes, especially where they run through unheated areas. Never insulate plastic pipes.
4. A dripping faucet wastes water and if it's dripping hot water, its wasting energy too. Often requiring nothing more than a new washer, fixing leaks is one of the quickest and least expensive ways of reducing the energy and water bills.
5. Another way to reduce waste is to take showers or baths depending on which uses less hot water than baths, other say baths use more. They are both right. Which is correct for you depends on how long and hot your showers are and how deep deep and warm your baths are.
6. Using less hot water may be easier than you think. Water conserving shower heads and faucet aerators can cut hot water use inn half.. To see if this will work for you, first determine what your faucet and shower flow rates are now.
7. To select the right water heater for your home, you need to consider family size and whether your usage would be considered high or low demand. It is assumed that you know your family size, so all you have to

determine is your usage profile.

COMPUTER

1. Computer that runs 24 hours a day, for instance, used more power than an energy efficient refrigerator.
2. Screen savers save computer screens, not energy. Start-ups and shutdown do not use any extra energy, nor are they hard on your computer components. In fact, shutting computers down when you are finished using them actually reduces system wear and saves energy.
3. Purchase flat-screen LCD monitors.
4. Setting computers, monitors and copiers to sleep-mode when not in use helps cut energy costs by approximately 40%
5. Activate and standardize 'power down' on new and existing PCs
6. If your computer must be left on, turn off the monitor; this device alone uses more than half the system's energy.

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