

Introduction to Energy Management and Auditing



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Energy Management

What is Energy

Energy is the ability to do work and work is the transfer of energy from one form to another. In practical terms, energy is what we use to manipulate the world around us, whether by exciting our muscles, by using electricity, or by using mechanical devices such as automobiles. Energy comes in different forms - heat (thermal), light (radiant), mechanical, electrical, chemical and nuclear energy.

Do you know that per capita consumption of energy for fruitful i.e. **productive** work is being recognized as a measure of development of a country?

Forms of Energy

There are two types of energy - stored (potential) energy and working (kinetic) energy. For example, the food we eat contains chemical energy and our body stores this energy until we release it when we work or play.

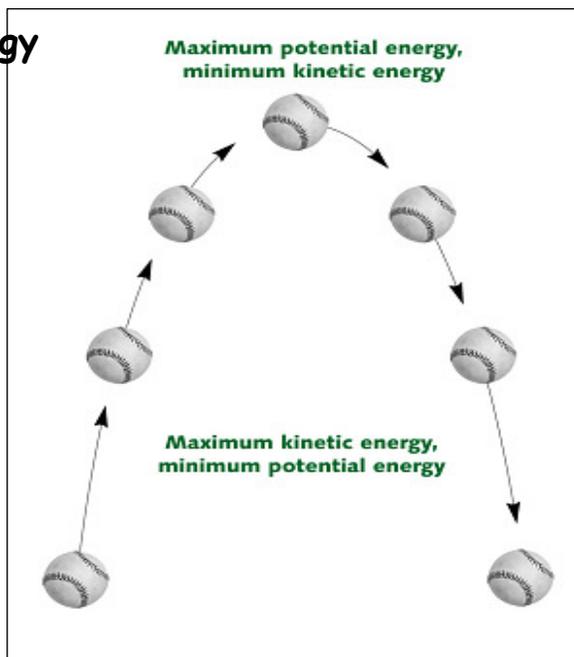
Potential and Kinetic Energy

Potential energy

- Chemical Energy
- Gravitational Energy
- Stored Mechanical energy
- Nuclear energy

Kinetic energy

- Radiant Energy
- Motion
- Thermal
- Electrical
- Sound



Commercial and Non-Commercial Energy

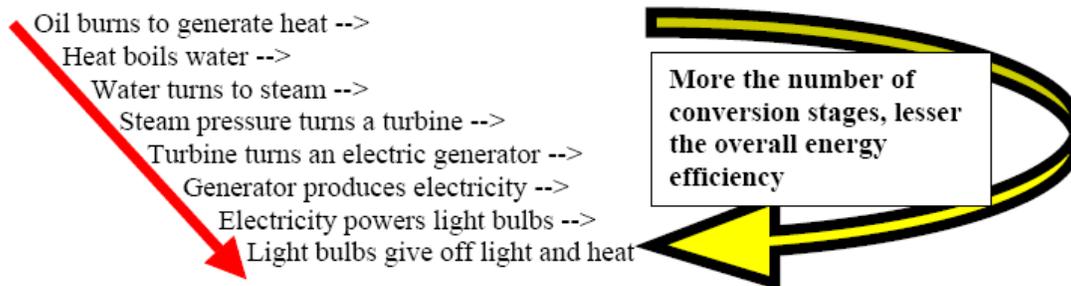
The energy sources that are available in the market for a definite price are known as commercial energy. By far the most important forms of commercial energy are electricity, coal and refined petroleum products. Commercial

energy forms the basis of industrial, agricultural, transport and commercial development in the modern world. In the industrialized countries, commercialized fuels are predominant sources not only for economic production, but also for many household tasks. Examples: Electricity, lignite, coal, oil, natural gas etc.

The energy sources that are not available in the commercial market for a price are classified as non-commercial energy. Non-commercial energy sources include fuels such as firewood, cattle dung and agricultural wastes. These sources are traditionally gathered, and not bought at a price, to be used especially in rural households. These are also called traditional fuels. Non-commercial energy is often ignored in energy accounting. Example: firewood, agro waste in rural areas, solar energy for water heating, electricity generation, for drying grain, fish and fruits, animal power for transport, threshing, lifting water for irrigation, crushing sugarcane, wind energy for lifting water and electricity generation.

What is Energy Efficiency

Energy efficiency is about using energy in your home in a way to make sure you are comfortable, but not wasting this valuable resource and, at the same time, your money. We use energy at the last end of the chain. So we actually



lose more than what we waste. See the following chain.

What is energy management

Energy management is using as little energy as possible to get things done. Cumulative impacts of using energy extravagantly are in terms of environmental degradation Global warming and ultimately, climate change. The judicious use of energy in any process is energy management.

Why manage Energy

Energy consumption per capita per year for productive uses is a well accepted indicator of the development level of any country. More the energy consumed for productive uses, more time is saved and can be used for alternative productive activities. Then why should we save energy? The more we consume, the better we will be on development scale! **Is it so....** No consider the word **productive** in the definition. Energy consumption for productive activities is a positive indicator. The wastage of energy is not the use of energy. By sparing the energy resource for other productive purposes, we not only help our country to develop, but also helps to save our environment by reducing the carbon emissions into the environment.

How we use/consume energy

How we use energy? We walk, we talk, we run, we dance, etc., etc., etc. Yes, that is how we use energy. Ok but let's talk about the commercial energy. How do we use commercial energy sources available to us? We light up our rooms, we use fans, AC's, Coolers. We use room heaters in winters, we use geysers, we use computers, video games, we watch TV, and we dance to our music systems. In our schools and homes there are pumps for pumping the water, inverters/UPS's to charge the battery, water coolers for cooling water, ovens at labs and at canteens etc. So every time whenever we use any of these or any other such type appliances, we use energy.

Energy Auditing

Energy auditing is verifying, monitoring and analyzing the energy consumptions or uses and assessing the potential for conserving energy through making recommendations for energy efficiency with cost and benefit analysis and an action plan. In general, Energy Audit is the translation of conservation ideas into realities, with economic and other considerations within a specified time frame. **Let's see how to start auditing....**

Watt: The rating of any appliance in watt reflects its power consumption. Total energy is proportionate to the wattage and the time for which the appliance run (in hours). Our Electricity bill is just summation of product of appliance wattage and the number of hours of its operation. (Here your mom gets extra incentives for preventing you from watching Televisions for more then certain time). By the way energy consumption of audio devices also depends on the volume at which you enjoy music.

Step 1: Have an eye for Energy



Take a round of your school. Just try to have an eye for use of energy and wastage of energy. Start from your classroom; look at your classroom's roof. How many lights/ tube lights are on? Switched them off one by one until light remain sufficient for reading and at comfortable

levels. How many are required. How many bulbs/lights you have switched off? Go to your computer laboratory, how many computers are on and nobody

using it? In interval, if no one is in the rooms, are the bulbs, fans are on or some one has taken care and switched off all of them.

Attn: Unplug the implements which are not in use, since some devices may be drawing energy when you think that you have turned off, e.g. when your TV is plugged in and you have switched off through remote, it still draws power from mains. So keep the mains switch off and unplug the device when not required.

	Number of lights on	number of lights required	Numbers of light which were not required actually but were on	Average wattage rating of lamps	School hours
	2	3	4	5	6
Room 1					
Room 2					

- For easy calculation, count fan as 65 watts, Tube-lights 55 watt, for lams and CFL's get the original rating from the lamps. If not possible, consider candescent lamps as 60 /100 watt and CFL as 18/22 watt

Repeat the same exercise for fans and computers in your school. You can use the following table as your guide.

Energize yourself: Take actions



Energy consumptions can be reduced significantly by two ways, one and the simplest way is just to switching off all the energy consuming appliances, when not in use. You have seen that how much can be saved. You also need to consider that by saving

energy, you not only saving the money (for your parents or for your school) but you are also contributing your bit to save the environment. Most importantly, for the above efforts, you don't have to spend a penny, but at the end you will save significant amount in energy bills, and your parents/ teachers will thank you. So, **Lights! Action! Switch off!!**

Share your experiences: don't keep your ideas and experiences along with you. Collect information, try to analyze it, try to correlate your learning with other knowledge you have (like climate change, Global warming etc).

Induce energy to others: Motivate them



Once you understand that how much you are wasting and how and how much you can contribute to save our mother earth and our environment induce your feelings to others and let the things work. You have make some table while

working on **step 1**, come on, lets put some more energy on it. Analyze the previous table and try to create this one.

Most of the equipments are rated with the maximum power they consume. Refrigerators actually work for about 40-45 % of the actual time it is connected to the power. But again it varies as per the season, and usage (for how many times you open the door for taking out the cold drink)

	Number of watt hours (product of col 4,5,6 of previous table)	Number of school days in a year	Energy saving potential in class (2 x 3) /1000	Amount saved, per unit cost x 5
1	2	3	4	5
Room 1				
Room 2				

Second way is to switching to the energy efficient devices. Initially you may have to request to your parents / teachers but when you will give them the possible benefits, they will certainly appreciate your efforts and try to help you. See, that how much you can save by selecting the correct model or switching to better option. Now for some equipment there are energy stars

Incandescent lamps	CFL	Saving
100 W	25 watt	75%

for helping you for choosing the best

options available. (see box)

What are Energy Stars

Energy star rating shows you that how much is the electrical unit is efficient. Bureau of Energy Efficiency has just started Standards and Labeling programme to help the consumers to select the right and efficient product. So you don't have to rely on brand name now you have a tool to check the claims made by different manufacturers.

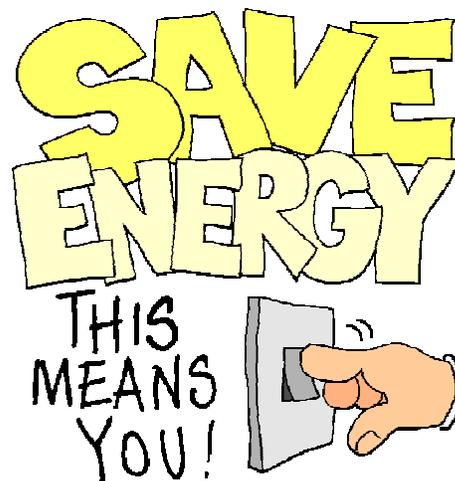
What I can do?

Just by doing simple things and following simple guidelines we can contribute significantly to achieve the energy efficiency targets. That's how we individually can work towards the sophisticated environment issues. In this module we have discussed mostly about the electrical energy. There is other energy resources exist about which we have to take care. Just think about the energy you use for transportation. This is a exercise for you to think about it and discuss it with your friends. Just for your suggestions you can pool the vehicle for going school, if school vehicle is not available or you can't use public transportation system.



Pledge of Saving Electricity

- Saving electricity is my national duty.
- I shall try essentially to save electricity.
- I shall always try to save electricity in my home and in the vicinity.
- I shall switch off the electrical appliances when not needed.
- I shall switch off the appliances wherever the electricity is consumed without reason.
- I shall not utilise appliances like heater or oven that consume much electricity.
- I shall use CFL, 14 W, 18 W Compact fluorescent lamp (CFL) instead of 100 W, 200 W bulbs.
- Thus today I pledge to carry out successfully the National Campaign of electricity.



Work together, work with us

You have done a little exercise at your and your friend's class room. Now, as an young Energy Auditor Tae the responsibility to carry out the auditing for whole of your school. At this time your are not required to calculate exact amounts you could save, but you will have to collect some more information. Ask your coordinator, or to us at any time when you are not clear what to do or have some more suggestions which others can follow. Some formats for collecting the information at school level is provided at the end, if you find that these are not enough develop new formats or ask us. **But remember**, more paper you waste, more energy you consume (for non productive work). Paper making is one of the intensive energy consuming Industry



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