**Electrical Systems Project**

**Design Challenge:** Students will perform an energy audit of their school. In addition,they will design a building/wing/floor that meets a certain power consumption criterion using conventional power sources (fossil fuels) and renewable power sources. How much energy can your school conserve?

**BACKGROUND**

The world’s focus these days is on energy:

* How do we generate ***energy***?
* Do we have enough resources to continue to generate ***energy*** in the future?
* How much ***energy*** do we use?
* How do we transmit ***energy*** from where it’s generated to the point of use?
* How sustainable are the ways we currently generate ***energy***?
* How can we conserve ***energy***?
* Do we realize just how much ***energy*** we consume?
* How much do we depend on foreign countries to provide the resources to create ***energy***?
* How much ***energy*** does the U.S. use compared to other countries?
* How much pollution or adverse effects are created when we produce ***energy*** by burning coal or diesel fuel?
* How much risk are we facing based on how we generate ***energy***?

It is hard not to pick up any newspaper/news magazine or watch any news program without a mention or segment about some facet of energy. The world economy may be slowing, but the world demand for energy keeps on rising as we keep increasing the number of: vehicles on our roads; computers in our homes, schools, and businesses; cell phones and personal electronic Internet devices; Internet uses; electronic surveillance; products we consumers demand; facilities needed to treat and deliver clean water, and collect and treat wastewater. Combine all that with the rising energy needs to keep existing and new buildings (homes, stores, offices, industries, etc.) safe and inhabitable with lighting, elevators, heating, ventilation, air conditioning and other purpose.

Some of us, particularly those of us in developed countries, tend to take access to energy for granted. That easy access is not only present during our normal daily lives, but also when we go away on vacation. We have become so reliant on energy to make our daily existence livable that we have forgotten what it is like to do without. It takes unwanted reminders associated with the forces of nature (earthquakes, cyclones, tornadoes, hurricanes, snow storms, heavy rains) when all electric power is cut off to a region or small/local area that we realize that we cannot live without energy. But to continue to meet our rising appetite for energy, it appears that we must

* ***understand*** how much energy we currently use,
* ***learn*** how we can conserve energy,
* ***study*** new ways to produce sustainable energy,
* ***examine*** better ways to deliver energy, and
* ***realize*** that we are all in this together and that grassroots individual efforts arewhat is needed to get us all moving in the right energy direction!

**Your team challenge is to answer the questions listed above and to perform an energy audit of your school. In addition, design a building/wing/floor that meets a certain power consumption criterion using conventional power sources (fossil fuels) and renewable power sources.**

To conduct your energy audit of your school, select a specific time of year and location, and conduct the research necessary to identify where energy is used (school boiler) and estimate the amount of energy used by the device.

First, organize all the energy using devices identified according to the amount of energy you have determine they use. List them in a table from the highest (top of the list) to the lowest (bottom of the list). Include a column on this table that indicates which of these devices you believe can work with to conserve energy. Use a yes, no, or maybe to populate this column. This column should be developed at the time the devices are first identified and before any research is conducted to determine what steps might be recommended to conserve energy.

Secondly, determine how to reduce the energy footprint you just identified above. Think about how you would design a building/wing/floor that meets a certain power consumption criterion using conventional power sources (fossil fuels) and renewable power sources. You are encouraged to seek more energy efficient devices/operating systems.

Consider renewable power sources that you could safely install and operate separate from your local utility. Some of these renewable power sources will be contingent on where you live. Describe what those sources are, the feasibility of installing and operating them, and estimate the amount of energy that they would create to off-set the local utility. Don’t forget to consider how much these systems would cost to purchase, install, and operate. Do they cost more than the cost for energy provided by the local utility? Is it more sustainable? Make a case for why you would or would not recommend moving forward with implementing the renewable power sources you have identified.

What other steps would you recommend to reduce your energy footprint? Think about the following incomplete list of areas to consider: lighting, heating, ventilation; insulation; windows, etc. Review your table of energy using devices and assess where you could reduce the amount of energy used with each device. Can you come up with recommendations that reduce your energy footprint by 10%, 20%, 50% or more? Don’t forget to take credit for a consistent, reliable renewable power source.

Go back to the table generated in part one and redo the table by adding the estimated reduction in energy you have determined by implementing your recommended actions. Indicate replacement devices or new steps that you are recommending that will reduce your energy footprint.

Lastly, build a design of a building/wing/floor of your recommendation that meets a certain power consumption criterion using conventional power sources (fossil fuels) and renewable power sources.

How much energy have you saved/conserved?