**Personal Energy Audit and Report**

Most of the principles set forth in this environmental science course are illustrated in all aspects of life’s activities, from the personal to the planetary level. One area of critical importance is energy consumption, particularly electrical energy consumption. The fuel of choice for electricity production in the United States is coal. About two-thirds of the SO2 emitted into the atmosphere is a result of burning coal in electrical power plants. The use of pollution control devices, or scrubbers, can effectively reduce the amount of SO2 emitted, but the majority of power plants in the US have not been equipped with scrubbers. About 80 percent of the incidence of acid rain in our atmosphere is attributed to these emissions.

Global warming is also impacted by the combustion of fossil fuels to produce electricity. About one-third of CO2 emissions are due to the production of electricity. Coal produces more CO2 per energy unit than either oil or natural gas due to its carbon content. Approximately 0.77 kg of CO2 is emitted per kilowatt-hour of energy produced. (This value will vary depending on the actual carbon content of the coal and the efficiency of the power plant.) There are no pollution control devices that can convert carbon dioxide into an environmentally harmless substance. The only way to reduce the CO2 emissions associated with the combustion of fossil fuels is to reduce consumption.

All of us have a stake in all levels of energy use and production, but it is certainly easier to assess our impact when examining personal energy habits and attitudes. In this assignment you will examine your personal energy habits with regard to electricity consumption and the impacts those habits have on the environment. Having a thorough understanding of your own system’s dynamics and connections will lead to an easy transition to understanding the energy dynamics at a broader level, for example, those of a regional or global system. Positive changes that can be made effectively at an individual level can be amplified at the national level.

Therefore, keep in mind the following ideas when evaluating your home as a small part of a larger shared energy system:

1. Areas where reduced consumption will result in monetary savings (for you).
2. Changes on both a personal level and a household level that will be reflected in an improvement to a larger, shared system (for example, reduced electricity consumption leading to reduced fuel consumption by the utilities, less air pollution, less peak electricity consumption, and so forth).

**Analysis of Electricity Consumption**

1. Reading and Recording Electricity Consumption:
* Read the electric meter at the same time every day for a 10-day period and record the values.
* Make daily notes on the patterns of electricity use in your household, particularly the use of large appliances.
* Note the usual settings for the air conditioner and water heater, the amount of cooking done, the type of lights used, the amount of laundry done, and so forth.
* Also, make notes on aspects of the weather that may affect heating or cooling. Weather notes should include cloud cover and high and low temperature readings for that day. Report local temperature readings and thermostat settings in degrees Celsius. An example data table is provided below:

Table 1: Meter Readings, Observations and Usage Notes for a period of **10 days.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Meter Reading (kWh)** | **Daily Usage (kWh)** | **Weather Observations** | **Notable Appliance Usage** |
| 3/25 | 38,044 | N/A | Partly cloudyHigh: 66°F |  |
| 3/26 | 38,066 | 22 | Partly cloudyHigh: 73°F |  |
| 3/27 | 38,104 | 38 | Light rainHigh: 55°F |  |
| 3/28 | 38,137 | 33 | Mostly sunnyHigh: 46°F |  |
| 3/29 | 38,165 | 28 | SunnyHigh: 52°F |  |
| 3/30 | 38,186 | 21 | Scattered showersHigh: 66°F |  |
| 3/31 | 38,202 | 16 | SunnyHigh: 73°F |  |
| 4/1 | 38,217 | 15 | Mostly sunnyHigh: 66°F |  |
| 4/2 | 38,230 | 13 | CloudyHigh: 73°F |  |
| 4/3 | 38,245 | 15 | Partly cloudyHigh: 82°F |  |
| Average Daily Usage | 22.3 |

1. Calculating Monthly Energy Consumption:
2. Obtain a copy of your electricity bill. Calculate the average daily cost for electricity in your house.
3. After calculating the daily electricity usage (in Table 1), average out the cost per kWh. If it is indicated on your electricity bill, how does your estimate compare?

Table 2: The Cost of Electricity

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Total Amount of Power Bill | Days of Power Bill | Average cost per day | Average usage per day (from table 1) | Average cost per kWh |
| $114.69 | 33 | $3.82 | 22.3 kWh | $0.11 |

1. In order to determine the amount of CO2 released by your electricity consumption each month, multiply the number of kilowatt-hours used per month by the kilograms of CO2 produced per kWh (see table 3 below). If a coal-burning power plant is the main source for your electricity, the amount of SO2 emitted per month can be approximated by multiplying the number of kilowatt-hours used per month by kilograms of SO2/kWh. Consult your local power utility to determine the fuel mix used to generate electricity in your area. (If coal or oil is used, determine the amount of SO2 produced.)
2. Find out if you use any natural gas or propane in your house (this is most likely used for a stove, dryer, or logs). If so, consult your recent bill and indicate the amount of gas consumed. List the appliances using gas and then, calculate your CO2 emissions using the chart below.

Table 3: Carbon Dioxide and Sulfur Dioxide Emissions, by Source, for generating electricity



1. **Description of dwelling and picture:**

Inspect and report on the following for your home and include a picture:

* 1. The amount, location and quality (type and R-value) of insulation
	2. The amount of shade provided by trees or shrubs
	3. The condition, composition, and color of the roof
	4. The air circulation in the attic
	5. The tightness of the fit for doors and windows
	6. The color of outer walls (does it absorb or reflect heat?)
	7. Any other features that may affect the dwelling’s heat balance

**The Report**

1. Data and Descriptions
2. Table 1
3. Table 2
4. CO2 and SO2 emissions for your home, including electricity and natural gas usage
5. Description of your dwelling and a picture
6. Discussion

In this section, analyze what you have learned through this project and make some detailed suggestions about how you and the members of your household can conserve energy by changing patterns of consumption. Examine the economics of these changes and their possible impact on the emission of pollutants from power plants. Some well-intended changes may carry an economic disadvantage (that is, they may not be cost effective at this time),. In these cases, suggest what steps could be used to remedy this situation. Supplement the discussion with drawings, graphs, or charts, as appropriate. The focus of this discussion should be on your home.

1. Include your general conclusions paragraph: Are you surprised by your findings? What errors could have been made? How is this lab relevant to the course? Include a document citation supporting your arguments.