Greenhouse Gas Emissions and Your Local Fuel

Objectives

The student will determine the greenhouse gas emissions of conventional power plants and for the local fuel mix and energy consumption.

Curriculum Focus

Science, Social Studies

Materials

- Internet access

Key Vocabulary

Carbon dioxide
Emissions
Greenhouse gas
Methane
Nitrogen dioxide
Sulfur dioxide
Water vapor

Next Generation Science Correlations

- 5-ESS3 - 1
- 5-ESS3.C
- MS-ESS3 -3
- MS-ESS3.A
- HS-ESS3 - 1-5
- HS-ESS3.A-D

Background

Many chemical compounds found in the earth's atmosphere act as greenhouse gases. When sunlight strikes the earth's surface, some of it is radiated back toward space as infrared radiation (heat). Greenhouse gases absorb this infrared radiation and trap its heat in the atmosphere. Many gases exhibit these greenhouse properties. Some occur naturally. Some are produced by human activities and some gases are exclusively human-made, such as industrial gases.

There are several major greenhouse gases emitted in the United States as a result of human activity. They are included in U.S. and international emissions estimates: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O); industrial gases: hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6).

There are other greenhouse gases that are not counted in U.S. or international greenhouse gas inventories. Water vapor is the most abundant greenhouse gas but most scientists believe that water vapor produced directly by human activity contributes very little to the amount of water vapor in the atmosphere.

Ozone is technically a greenhouse gas because it has an effect on global temperature. However, at higher elevations in the atmosphere (stratosphere), where it occurs naturally, ozone is needed to block harmful ultraviolet (UV) light. At lower elevations of the atmosphere (troposphere), ozone is harmful to human health and is a pollutant regulated independently of its warming effects.

Procedure

1. Research conventional power plant emissions.
2. Make a chart of all emissions with headers for "type," "average amounts" and "resulting environmental effects."

3. Discuss the factors that affect the amount of emissions generated, such as type of fuel used and energy demand or consumption needed by the people of the community the power plant serves. Research your local power plant's emissions, if any. (Remember, thermal emissions [hot water] introduced into a local water system can have an affect on the local environment.)
4. Research other sources of greenhouse gas emissions. The Environmental Protection Agency (EPA) website is an informative source. (*epa.gov*)
5. Discuss how one person can help reduce the emissions generated. (use less electricity, install energy saving technologies, install alternative energy technologies)

To Know and Do More

1. Research the types and amounts of emissions from electrical generation of your state.
2. Research the types and amounts of emissions from transportation sources and how that compares with electrical generation.