

Introduction

Coal, oil and natural gas are called fossil fuels. Fossil fuels are burned to make energy. Burning fossil fuels also releases CO₂ (carbon dioxide) gas into the atmosphere. Most air pollutants (such as sulfur dioxide) don't stay in the atmosphere very long. CO₂ is different. Much of it stays in the atmosphere for over 100 years, until it is finally absorbed by the ocean.

CO₂ is found naturally in the earth's atmosphere. When we breathe in oxygen, we breathe out CO₂. Plants use CO₂ to grow.

CO₂ is a "greenhouse gas." It traps heat from the sun and helps make the earth a pleasant place to live. If too much CO₂ is in the air, it will trap too much heat. The temperature of the earth will increase. This is called "global warming" or "climate change." This may lead to a hotter, dryer climate, more intense storms, more floods and droughts, and rising sea levels. The change in climate can have an effect on crops, plants and animals.

Humans have burned ever growing amounts of coal, oil and natural gas (fossil fuels) over the past few hundred years. This has caused the amount of CO₂ in the earth's atmosphere to increase. There is about 30% more CO₂ in the atmosphere today than there was a few hundred years ago. The amount continues to grow ever more rapidly

Power plants that use fossil fuels to make electricity release the most CO₂ of all man-made sources.

In Pennsylvania (PA), we get most of our electricity from burning fossil fuels (coal, oil and natural gas). 56% comes from coal power plants and 6% from natural gas plants. The other large source of our electricity is nuclear plants, at 35%.

Problem Question

The Current Situation

Today, much of the electricity in Pennsylvania (PA) comes from traditional coal plants and nuclear plants. Traditional coal plants release CO₂ (carbon dioxide) into the air. CO₂ is a gas that contributes to climate change.

The Future Situation

PA will need more electricity in 25 years than the power plants it has now can make. So, new plants will need to be built. The original plan was to build all traditional coal plants. But, suppose that the U.S. Congress has just passed a law to reduce the CO₂ released by power plants built in the future. As a result of this law, the State of PA must change some of the power plant types that will be built here over the next 25 years. These power plant types will collectively need to release less CO₂. Imagine that the Governor of Pennsylvania has asked you to serve on a Citizen's Advisory Panel to give advice on the kinds of plants to build.

Your Task

Your job is to rank the different power plant types from best to worst.

Power Plant Types

The attached envelopes have information about these power plant types:

- Advanced biomass power (which is made from wood chips and farm crops).
- Advanced coal plants with CO₂ capture equipment (which cuts the CO₂ released by the plant).
- Advanced coal plants (without CO₂ capture equipment).
- Advanced nuclear plants.
- Natural gas plants.
- Solar cell power.
- Traditional coal plants with CO₂ capture equipment (which cuts the CO₂ released by the plant).
- Traditional coal plants (without CO₂ capture equipment).
- Wind power.

An additional option that could reduce the number of new plants that have to be built is:

- Energy efficiency or using less electricity (such as using more efficient appliances or insulating buildings). If we use less electricity, fewer plants need to be built.

What's in the other Envelopes

- The sheets in Envelope #2 will give you general information about each power plant type.
- The sheets in Envelope #3 will give more detail about (a) how much each power plant type pollutes and (b) the cost of electricity made by each power plant type.

Your Instructions (Please read through all of the instructions before beginning).

1. Look at the next page. Use this "Power Plant Ranking" sheet to take any notes you want about the power plant types. Think about what you like and dislike about each one as you read through the information.
2. Open Envelope #2. Read the sheets in the order they are provided.
3. Open Envelope #3. Before looking at the graphs on each sheet, read all of the text at the top of the page. Note that each power plant type has been assigned a color. This color is the same for both graphs in Envelope #3. It also matches the color border to the corresponding power plant sheet in Envelope #2.
4. Rank the power plant types from best to worst. To do this, we suggest that you look at your "Power Plant Ranking" notes. You may also want to take the power plant sheets from Envelope #2 and sort the sheets in order from best to worst. When you have made a decision, write the numbers 1 to 10 on the "Power Plant Ranking" sheet. 1 will be the best, 2 will be the second best and so on. 10 will be the worst.
5. Finally, open up Envelope #4 to learn about the next steps.
6. Now, go back to Step 1 of these instructions and begin. Make sure to refer back to these instructions between every step in the process.