

LESSON PLAN: Mercury Emissions

Student Handout: Glossary

Age of Plant: How old the plant is will affect the operating costs. Older facilities are typically less efficient and cost more to upgrade.

Types of Coal:

Introduction: Coal is a rock made from dead plants that grew in ancient swamps. Coal is divided into four major categories and several subcategories depending on purity, moisture content, impurities, and amount of trapped gases. Rarely is one type of coal from one mine burned by a power plant. Instead, different grades are blended according to heat content, impurities, location, and price.

Coal used in this game: **Lignite:** Sometimes referred to as “brown coal” or “young coal”, this type of coal gives the least amount of heat per pound. Therefore, more lignite needs to be burned to make one megawatt of electricity than the other types. Lignite accounts for 4% of all coal burned for electricity and is mined in TX.

Sub- and Bituminous: This intermediate-grade coal, along with subbituminous, accounts for 95% of all coal-fired electricity generation. It is found in 20 different states. Sub-bituminous is a lesser grade than bituminous.

Anthracite: This “hard” coal is common in P.A. and is used in steel production. It has the highest purity. When it is burned for electricity, it is often blended with bituminous coal.

Operating costs: This is how much it costs to make one megawatt-hour of electricity. This number accounts for labor, facilities, maintenance, interest on bonds sold to build the plant, the cost of coal and coal transportation. This number is given to the player on the starting card and should be copied into each space on the column on the grid. To make the game simpler, operating costs do not change.

Capital improvements: How much money is required to reduce emissions by one pound of mercury for one megawatt-hour of electricity. This number is affected by the age of the plant and what type of coal is being burned. The cost to upgrade is found by this calculation:

$$(\text{Age of plant}) \times \$10 = \text{one pound reduction of emissions}$$

The cost to upgrade is paid once and the benefit is kept for the rest of the game.

Emissions: How many pounds of mercury are emitted when one megawatt is generated.

Allowance: How many pounds of mercury can be emitted legally. This number is set by the EPA and is pre-filled.

Emission profit/loss: If the allowance is greater than emissions, then the company has a “profit” and this extra allowance can be sold for a profit. If the emissions are more than the allowance, then extra allowance credits must be bought. The selling price of 1 pound of emission is \$40.

Electricity price: This value is determined by the laws of supply and demand. In order to make the game simpler, this value will not change and is pre-filled. It is based on 50 megawatt-hours at \$20 each.

Yearly profit/loss: Is your company making money? This is found by this calculation:

$(\text{Electricity price}) - (\text{operating costs}) \pm (\text{emission profit/loss}) - (\text{upgrade costs}) = \text{profit/loss}$

If your company is losing money, keep playing. Consider upgrading your facilities.

Total profit/loss: This is a running total of how your company is doing from year to year.