

CASE STUDY: Solar Energy

LESSON: Solar Savings

LESSON DESCRIPTION: Students will investigate the cost, benefits, challenges, and potential savings (if any) involved with using renewable energy to power a small business versus the use of conventional electricity generated from fossil fuels.

ENVIRONMENTAL ISSUE: Fossil fuels, such as coal, oil, and natural gas, are still the most widely used source of energy in the United States. Given rising fuel costs, environmental impacts and concerns about how long fossil fuels will last as a non-renewable resource, an increasing number of state and federal mandates and incentives are in place to increase the use of renewable energy. Other concerns about fossil fuels include the economic and security issues that may result from our nation's dependency on fuel imports from often hostile foreign countries.

ECONOMIC CONCERN: As the cost of fossil fuels continues to rise and renewable technology becomes more affordable, an increasing number of consumers may choose to explore the use of renewable energy for their homes or businesses. In such instances, considerations typically include the cost of initial equipment and installation, the expected lifespan of the equipment, and availability of renewable energy sources in the region.

ECONOMIC CONCEPTS:

- Benefits
- Costs
- Incentives
- Savings

OBJECTIVES:

- Students will identify viable, reliable, and cost-effective sources of renewable energy and non-renewable energy in the region;
- After investigating solar energy, students will determine the cost, benefits, challenges, and potential savings (if any) of using solar energy;
- Students will understand the economic, environmental, practical and other advantages and disadvantages of renewable energy and non-renewable energy;
- Students will demonstrate the effective use of data and math computations to determine the type of energy that would be most cost-effective for a business.

CONTENT STANDARDS:

South Carolina 8th Grade Science Standard

8-3.5 Summarize the importance of minerals, ores, and fossil fuels as Earth resources on the basis of their physical and chemical properties.

ENERGY SCENARIO:

John Baker is the new proud owner of All Things SC in South Carolina. The store has been passed down for generations and has been in his family for more than 60 years. He has been working at the store since he was ten years old and observed his grandfather and father run the business to the best of their abilities. However, John grew up in the green business revolution and believes that it is important to be environmentally friendly. He always urged his father to be more energy efficient. His father did install compact fluorescent light (CFL) bulbs which were more energy efficient and cost effective for the store. However, John has been researching renewable energy and has decided he wants to explore using it to help fulfill his store's energy demands.

John began thinking about renewable energy for his business when he came across an article in the local newspaper about Boeing using solar panels to provide energy for their factory.

Immediately attracted to the idea of using solar energy for his store, John began investigating the pros and cons of installing solar panels. He researched other businesses using solar energy, the costs to purchase and install solar panels, and the average lifespan of solar panels.

On average John's 5,000 square-foot store uses 2,000 kWh (kilowatt-hours) of electricity monthly, a daily average of 67 kWh. The average rate his electric utility, AE Electric, charges for commercial electricity use is 10 cents per kWh. So, on average John spends \$200 on the electric bill each month and about \$2,400 a year on electricity.

John is looking to supplement his electricity use with solar energy. He understands that his initial financial investment will be significant, but in the long run he hopes to save money and help the environment. If John uses solar energy, he predicts that he could reduce his business's CO₂ emissions by as much as 20-30 percent. After calculating what he will need, John wonders if he can afford enough solar panels to cover the store's average electric use. He knows that he will still need to purchase energy from his electric utility at night, on cloudy days and any time his solar panels aren't producing enough electricity to meet his immediate needs. John determines

that he needs enough solar panels to produce 67,000 watts daily. John finds solar panels that produce 250 watts each per day. He will need to purchase 268 solar panels to achieve his goal. Each solar panel will cost about \$350 including installation, which amounts to a total cost of approximately \$93,800. Because there are government incentives for investing in solar energy, John anticipates receiving a Federal Business Energy Investment Tax credit of 30% and a State Energy Tax credit of 25%. The credits would lower his total estimated out-of-pocket costs to \$49,245.

John needs help deciding if he should invest so substantially in solar energy for his store or continue buying all of his electricity from AE Electric. Complete a thorough cost benefit analysis to help John determine what would be the best choice for his store. Then explain what you would recommend that John do about his energy dilemma.

VOCABULARY:

Boeing	Energy	renewable energy
CO ₂ emission	environment	solar energy
compact fluorescent lamp (CFL)	fossil fuels	solar panel
electricity	kWh (kilowatt-hours)	watts

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Decision Making/ Cost Benefit Analysis

PACED Decision Making Grid

- P. What is the **problem**?
- A. What are the **alternatives**?
- C. What are the **criteria**?
- E. **Evaluate** the alternatives.
- D. Make a **decision**.

	Criterion	Criterion	Criterion	Criterion
	Ranking:	Ranking:	Ranking:	Ranking:
Alternative: AE Electric Energy				
Alternative: Solar Energy				

AE Electric

Advantages **Disadvantages**

Solar Energy

Advantages **Disadvantages**