Solana: Renewable Solar Energy in Your Neck of the…Desert

Over the last several decades, technological advances have made solar energy one of the largest sources of renewable energy. Solar energy has the potential to meet a lot of our energy needs. Meeting our energetic needs is done using a variety of technologies. For example, there are photovoltaic systems and trough systems. In this lesson students will explore a solar power plant that uses a trough system to concentrate solar power for energy.

Students will read short news articles about a recently constructed solar power plant outside of Phoenix, AZ and work in groups to discuss how our energy needs affect the three pillars of sustainability: the economy, the society, and the environment.

Before beginning, students should: understand the flow of energy to and from earth, the basic physical properties of matter, and how energy is stored and transferred by a power plant.

Essential Question:

The objective of this lesson is to demonstrate why we should invest in renewable energies like solar power plants to meet our future energy needs?

At the end of the lesson, students will be able to:

1. *describe how solar power plants generate electricity.*
2. *discuss tradeoffs associated with different forms of energy production.*
3. *relate the benefits of renewable energy for our economy, environment, and society.*

Standards Addressed: *Science Strand 1: Science Inquiry Process, Concept 1: Observations, Questions, and Hypotheses; Science Strand 3: Science in Personal and Social Perspectives, Concept 1: Changes in Environments; Science Strand 3: Science in Personal and Social Perspectives, Concept 2: Science and Technology in Society; Science Strand 5: Physical Science, Concept 1: Structure and Properties of Matter; Science Strand 5: Physical Science,*

Concept 3: Conservation of Energy and Increase in Disorder; Science Strand 6: Earth and Space Science, Concept 2: Energy and the Earth System

Themes: Systems dynamics, Tradeoffs, Scale

Skills: Evidence based thinking, Oral communication, Research skills, Written communication, Team skills

Key Vocabulary

Sustainability: *meeting the needs of the present without compromising future generations to do so.*
Trade-off: *pros and cons of making a choice.*
Priority: *a thing that is considered more important than another.*
Trough system: *a U-shaped mirror used to concentrate solar energy into a single location.*
Renewable energy: *a source of energy that is not depleted when used.*
Non-renewable energy: *a source of energy that is finite and can eventually be used up.*

Materials Needed:

- **Solana: Renewable Energy in Your Neck of the . . . Desert: Video pdf**
- **Solana: Renewable Energy in Your Neck of the . . . Desert: Close Reading pdf**
- **Link to the video: http://www.energy.gov/eere/videos/energy-101-concentrating-solar-power**

Teaching Instructions

Advanced Preparation

Print news articles and discussion questions.

Engagement

1. Ask students if they have ever heard the term sustainability.
2. Ask students what sustainability means to them. If they are having a hard time, get them thinking about what they need personally to sustain them.
3. From their list tease out the three pillars of sustainability: environment, society, and economy.
4. Ask students about renewable and non-renewable energies.
5. Hand out “Solana: Renewable Energy in Your Neck of the . . . Desert: Video” and segue into the video on concentrating solar power.
6. Have students take notes on solar technology during the video.

Exploration: 1. Hand out "Solana: Renewable Energy in Your Neck of the . . . Desert: Close Readings" and have students complete Part 1. 2. Read the instructions to your students given in Part 2 of the document for the discussion questions. 3. After students read the articles for the second time, arrange students in groups of 3-4 and assign each group a couple of the discussion questions. They should record their answers on the worksheet
Explanation: 1. Have the students discuss with the class how they answered their discussion questions. 2. In their small groups, guide students to draw concept maps illustrating the process of generating electricity from a concentrating solar power plant. Encourage students to use geometric shapes, arrows, labels etc. to diagram the process.
Elaboration: Ask students to brainstorm how the generation of non-renewable energies differs from what they just discussed with renewable energy production. a. Give them time to list some similarities and differences between the ways of producing energy. Which is more effective, efficient, sustainable, why?
Evaluation: Conduct an informal assessment by asking students to think about tradeoffs with how we currently produce energy. How do our energy production methods impact the economy, society, and the environment?

Additional Resources

To learn more about concentrating solar renewable energy and non-renewable energy production visit sustainableschools.asu.edu for more lesson plans.

References

Articles:

http://www.solarnovus.com/world-s-largest-parabolic-trough-solar-plant-begins-operation_N7079.html

http://solareis.anl.gov/guide/solar/csp/