

Solar Solutions

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Subject:	Science
Grades:	4-8
Length:	30-60 minutes
Focus:	Renewable Energy, Solar Energy

Rationale:

We depend on energy for every aspect of our lives. The future of energy, both in the United States and in the world, is dependent on how we take care of the Earth's natural resources. The sun is a perpetual source of energy that has no environmental impacts, in theory. If we can harness the energy of the sun, we can drastically change the way we approach energy generation and consumption.

Objectives:

The purpose of this lesson is to introduce solar energy to students. This includes how it is generated, consumed, and local applications of solar energy.

Students will:

- Define solar energy and realize that the sun has enormous energy potential.
- Discover the environmental, economic and social benefits of solar energy.
- Learn the basics of how solar power works.
- Learn about local applications of solar power in our community.

Background:

All of the energy we use on earth comes from natural resources. These include coal, natural gas, hydropower, biomass or other sources. However, when we really think about energy sources, we realize that all energy originally comes from the sun. For instance, the sun creates the weather, which in turn results in wind or precipitation, which results in wind power or hydropower. The sun also allows things to grow, which may turn into biomass energy or even fossil fuels, as they were once living things a long time ago. Fossil fuels such as coal, oil and natural gas are made from the remains of prehistoric plants and animals. The energy in them came from the sun. We use that energy to cook our food, warm our houses, run our cars, and make electricity.

The sun is the most inexhaustible, renewable source of energy known to humans. Everyday, the sun radiates an enormous amount of energy. Every 15 minutes, the sun produces enough power to supply the earth for an entire year. We use the sun's energy for light, warmth and for growing plants. We also use the sun's energy to heat buildings and water and

to generate electricity. Solar energy has great potential for the future as it is free and supplies are unlimited. It does not pollute or damage the environment. It cannot be controlled by any one nation or industry. If we can improve the technology to harness the sun's enormous power, we may never face energy shortages again. However, we have not used the sun's energy to its fullest potential. Solar electricity can be produced by the use of **photovoltaic cells**. **Photovoltaic** comes from the words **photo**, meaning light and **volt**, a measurement of electricity. One of the most popular uses of photovoltaic power is in solar powered calculators, which are found in most schools or offices. Photovoltaic cells are made of silicon (sand), which is the second most common substance found on earth. The silicon is heated to extreme temperatures, and chemicals (usually boron and phosphorous) are added. This sets up an unstable environment within the solar cell. When light strikes the cell, electrons are dislodged and travel along wires placed within the cell. The electrons follow the wire and power whatever load is attached. This flow of electrons is called electricity. The electricity can then power homes, businesses or schools.

Central Oregon is an ideal place for solar electricity, as we have many sunny days throughout the year. There are a number of places that already use solar electricity, such as Summit High School, Miller and Rosland Elementary Schools, Ray's Food Place, and many homes in the area. By using solar electricity, these places are reducing their impact on the environment.

Materials:

- The Power of the Sun (Appendix A)
- Photos of local solar panel installations
- Examples of solar systems
 - Perhaps a solar battery charger or light, calculator, or toy
- Items that can be loaned from Environmental Center
 - Solar panel, solar toys

Procedures:

I. Introduction and Review of Energize It! (10 minutes)

Review concepts from previous lesson on energy.

- Have students define energy and tell why it is so important to us.
- Have students define some renewable and non-renewable energy sources and brainstorm specific energy sources (such as fossil fuels, hydropower, solar energy, etc.).
- Ask students what are some negative consequences of the generation of energy from traditional sources such as fossil fuels. Answers might include:
 - Pollution from burning fossil fuels.
 - Depletion of non-renewable resources.
 - Habitat and ecosystem destruction.
 - Greenhouse gases and climate change.

II. The Power of the Sun (10 minutes)

Ask students to brainstorm how the sun helps us in our everyday lives. An example to start with – “The sun helps my clothes dry on the clothesline in my backyard”.

Other examples might include:

- The sun makes us warm in the spring time.
- The sun turns on my calculator when I need to use it.
- The sun makes the plants grow in my garden.
- The sun wakes me up every morning.
- The sun makes me happy.
- The sun makes the sky really blue.
- The sun melts the snow on the mountains to make water.
- The sun creates weather around the globe.

Discuss with students the incredible power of the sun. The sun creates all forms of energy. For instance, where does oil and coal come from? Fossil fuels are the remnants of very old (millions of years) plant and animal matter that was buried deep within the ground. Of course, the plants were able to grow and survive by the sun's energy.

- Use Appendix A– The Power of the Sun, to discuss facts about the sun and the potential of solar power.

III. Harnessing the Power of the Sun for our Everyday Lives (10 minutes)

Discuss with the class the use of solar energy to create electricity to heat buildings, light our rooms and run appliances.

Discuss the difference between passive solar heat and solar electricity.

- A **passive solar system** doesn't use any additional mechanical support and can just be the way a building is built so that the windows get the most sunlight possible. This example may be found in the classroom or elsewhere in the school.
- An **active solar system** utilizes **photovoltaic (PV) solar panels** to generate electricity to power heat, lights, appliances, etc. Photovoltaic panels are made from tiny bits of silicon that generate a direct current (DC) of electricity. Explain briefly how the silicon particles are charged and send electrons off through a wire. This is how electricity is created. There are also **solar thermal systems** that heat water directly for use in showers, dishes, etc. Electricity is not generated in these systems. A home could have both solar PV and solar thermal systems.

Show students photo examples of local photovoltaics, such as Ray's Food Place, Sunlight Solar, residences, the Oregon Capital building, etc. Ask students if they've seen other examples of solar panels and where. Ask why solar energy can be so useful here in Central Oregon. (Because we have many days of sunshine here.) Note that solar panels do work on cloudy days as well, but just do not produce as much electricity.

IV. Solar Energy in Action (5 – 10 minutes)

Briefly discuss what photovoltaic panels are made of and how they work.

Share with the students the way in which a solar panel can convert energy.

Show the Examples of solar systems--Perhaps a solar battery charger or light, calculator, or toy.

Show students a real photovoltaic panel that they might see on a building (if obtained from Sunlight Solar or elsewhere).

V. Conclusion (5 – 10 minutes)

Pass out the Solar Energy Crossword Puzzle if time allows.

Ask students to think of pros and cons of solar power. Discuss energy conservation as well.

Attachments

The Power of the Sun!

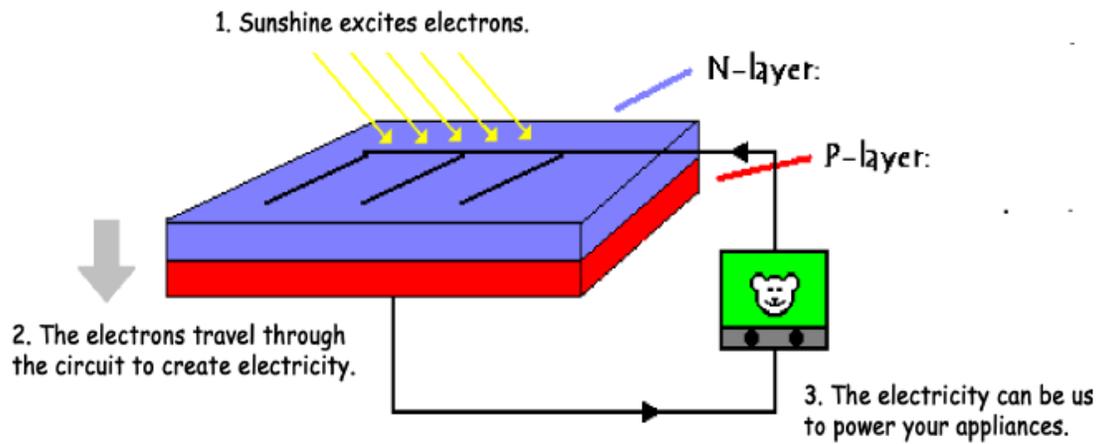
Photos of local solar systems

Enrichment and Internet Resources for Solar Solutions

The Power of the Sun!

- The sun is 93,000,000 miles away from the earth!
- Sunlight takes about 8 minutes to reach our planet.
- Every 15 minutes, the sun produces enough power to supply the earth for an entire year.
- Solar energy provides light, heat, and energy to all living things on Earth.
- Radiation (radiant energy) is another name for sunlight.
- The sun is the most inexhaustible, renewable source of energy known to humans.
- Sunlight travels at about 186,282 miles per second.
- Many civilizations, present and past, worship(ed) the sun – Aztecs, Mayans, Native Americans, etc.
- Solar energy is responsible for weather systems and ocean currents.
- Fossil fuels, such as oil and coal, began as plants or animals whose energy came from the sun hundreds of millions of years ago.

Photovoltaic Panel



Appendix C: Enrichment and Internet Resources for Solar Solutions

Enrichment # 1

Students role-play a public forum debate in which they have to defend an energy issue. Possible topics include building a dam, shutting down a nuclear power plant, or using solar panels on government buildings.

Enrichment #2

Students bring in articles from newspapers and magazines that pertain to energy issues.

Internet Resources

Energy Information Administration: <http://www.eia.doe.gov/kids> Explanations of energy sources and activities for kids.

Pacific Power: <http://www.pacificpower.net/env/bsre.html> Learn about their Blue Sky program, energy efficiency, etc.

Energy Trust of Oregon: <http://energytrust.org/> Energy Trust of Oregon's cash incentives, information and services help customers of Portland General Electric, Pacific Power, NW Natural and Cascade Natural Gas manage energy costs, increase comfort at home, improve productivity in the workplace and protect the environment.

Rocky Mountain Institute: <http://www.rmi.org> Promotes sustainable use of natural resources in businesses, communities and individual homes. Includes information about energy issues, recommended readings, research updates, etc.

Alliance to Save Energy Educators: <http://www.ase.org/educators> Downloadable lesson plans, Energy Smart School and Green Schools information available.

Pacific Gas & Electric: <http://www.pge.com> Energy saving tips, energy in the news, residential Services, etc.

Portland General Electric: <http://www.portlandgeneral.com> Models of energy efficient homes, renewable power information, solar for schools.

Northwest Energy Efficiency Alliance: <http://www.nwalliance.org> A nonprofit organization consisting of electric utilities, state governments, public interest groups and industry representatives that strive to bring energy -efficient products and services to the Northwest.

Additional Background Information can be found at:

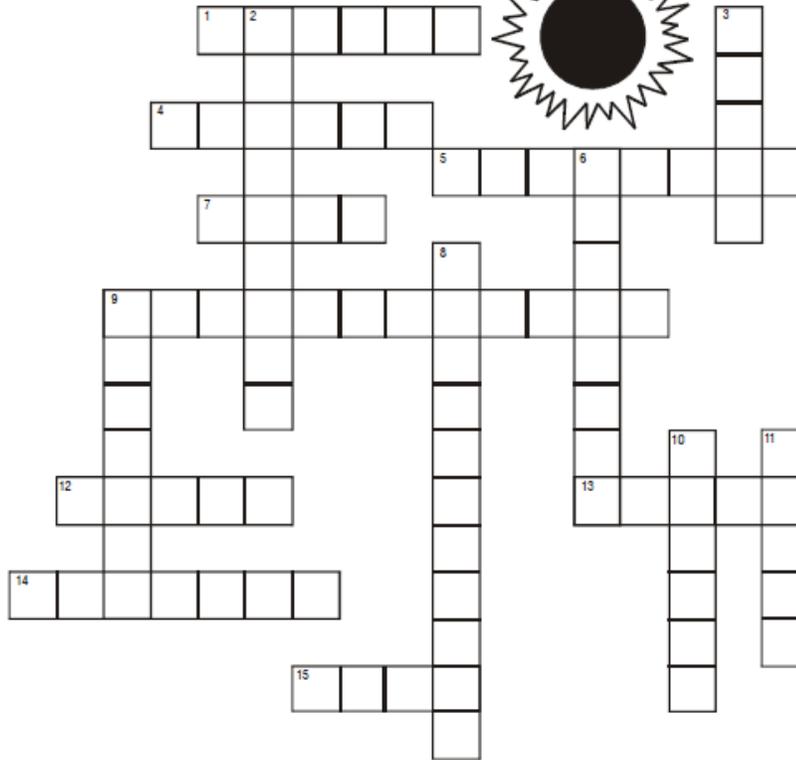
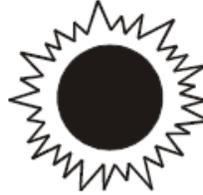
www.need.org

<http://solardat.uoregon.edu/EducationalMaterial.html>

<http://www.re-energy.ca/>

<http://www.eere.energy.gov/>

SOLAR



ACROSS

1. An ____ solar house has special equipment
4. Element produced in solar fusion
5. Element transformed in solar fusion
7. Light can convert to ____ when it is absorbed
9. Solar cell
12. Visible radiant energy
13. Direction PV cells should face in USA
14. Form of energy meaning heat
15. Measure of electricity

DOWN

2. Solar ____ gathers radiant energy and turns it into heat
3. Solar collector can heat ____ for showers
6. The sun ____ or sends out energy all the time
8. PV cells convert radiant energy into ____
9. Solar houses without special equipment to collect sunlight
10. Combining nuclei of atoms
11. Greek word for light



Summit High School



Miller Elementary School