

## Poster Contest

### Student Objective

The student:

- will be able to identify major events in the history of solar energy
- will work cooperatively to create a poster that communicates information.

### Key Words:

passive solar  
photovoltaic  
solar collector  
solar furnace  
solar still  
time line

### Materials

- posterboard or large sheets of paper
- various art materials, e.g. paints, markers, crayons and computer graphics
- time line information

### Time:

1 - 2 class periods

### Procedure

1. Divide the class into groups of three or four students.
2. Explain to the class that they will be creating a poster to depict a part of the time line of solar history, and then sharing them with the class.
3. Assign a period of history to each group. The groups may pick an number of events, scientists or inventions from the time period to research and represent.
4. Assist the groups as necessary while they are working on their posters.
5. When the posters are completed, have each group present their poster to the class and explain what information they are depicting.
6. Have the class vote on which time period in solar energy history they think is the most interesting and important
7. Hang the posters in the class for the duration of your work on Solar Matters.

### Key Words & Definitions

- **passive solar** - construction technique of using structural elements to bring in heat when needed and deflect or vent heat when it is not desired.
- **photovoltaic** - the effect of producing electric current using light from the sun
- **solar collector** - a device that collects solar energy
- **solar furnace** - a device that uses solar energy to heat , burn or melt
- **solar still** - a device that uses solar energy to distill a liquid
- **time line** - a chronological list of historical events that all relate to a specific subject

## Related Research

1. What are the future trends in solar energy? Research what the ‘experts’ think will be the trends in solar energy in the future.
2. Research important scientists in the history of solar energy.
  - The mean daily solar radiation is measured in Langleys, named for Samuel Langley. What did he do to earn this honor?
  - The reign of Louis XIV of France (1643-1715) was an era of solar experiments. Louis gained the title of Sun-King. Why?
  - Tales tell us that Archimedes saved the Greek city of Syracuse from Marcellus and his Roman fleet by using reflectors to concentrate solar energy on invading ships, which caused them to catch fire and burn. Is there any credibility to these stories?
  - Georges Buffon proved the potential of concentrating solar energy in 1695. What did he do?
  - Antoine Lavoisier built a solar furnace with curved glass sections filled with wine. What did he do with this solar furnace? How are solar furnaces used today?
3. Have the students produce skits about their time period.
4. Prepare a presentation to give to parents, a partner class or the school in general for Earth Day on the history and current applications of solar energy.

## Internet Sites

**[http://www1.eere.energy.gov/solar/pdfs/solar\\_timeline.pdf](http://www1.eere.energy.gov/solar/pdfs/solar_timeline.pdf)**

U.S. Department of Energy solar timeline

**[http://www.eia.gov/kids/energy.cfm?page=tl\\_solarthermal](http://www.eia.gov/kids/energy.cfm?page=tl_solarthermal)**

U.S. Energy Information Administration, Solar Thermal Energy Timeline for students

**[http://www.eia.gov/kids/energy.cfm?page=tl\\_photovoltaic](http://www.eia.gov/kids/energy.cfm?page=tl_photovoltaic)**

U.S. Energy Information Administration, Photovoltaic Timeline for students

## Poster Contest

			.1	.2	.3	.4	.5	.6	.7	.8	.9	.10	.11	.12
<b>Grade 6</b>														
<b>Practice of Science</b>	# 1	SC.6.N.1					X							
<b>Characteristics of Scientific Knowledge</b>	# 2	SC.6.N.2		X	X									
<b>Grade 8</b>														
<b>Science &amp; Society</b>	# 4	SC.8.N.4	X	X										
<b>Social Studies Standards</b>	Sixth Grade - SS.6.W.1.1 Eighth Grade - SS.8.A.1.2													
<b>Language Arts Standards</b>	Sixth Grade - LAFS.6.SL.2.4, LAFS.6.SL.2.5 Seventh Grade - LAFS.7.SL.2.4, LAFS.7.SL.2.5 Eighth Grade -													
<b>Visual Arts Standards</b>														

### Sixth Grade Benchmarks

#### Science–Big Idea 1: The Practice of Science

- SC.6.N.1.5 - Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.

#### Science–Big Idea 2: The Characteristics of Scientific Knowledge

- SC.6.N.2.2 - Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.
- SC.6.N.2.3 - Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.

#### Social Studies–World History

- SS.6.W.1.1 - Use timelines to identify chronological order of historical events.

#### Language Arts–Standards for Speaking and Listening

- LAFS.6.SL.2.4 - Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.
- LAFS.6.SL.2.5 - Include multimedia components and visual displays in presentations to clarify information.

### Seventh Grade Benchmarks

#### Language Arts–Standards for Speaking and Listening

- LAFS.7.SL.2.4 -
- LAFS.7.SL.2.5 -

### **Eighth Grade Benchmarks**

#### **Science–Big Idea 4: Science and Society**

- SC.8.N.4.1 - Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.
- SC.8.N.4.2 - Explain how political, social, and economic concerns can affect science, and vice versa.

#### **Social Studies–American History**

- SS.8.A.1.2 - Analyze charts, graphs, maps, photographs and timelines; analyze political cartoons; determine cause and effect.

## Poster Contest - Solar History Time Line

### 4.5 billion years ago

- Solar energy reaches the earth

### 600 - 700 B.C.E.

- Magnifying glass used to concentrate sun's rays to make fire

### 200 - 300 B.C.E.

- Greeks and Romans use "burning mirrors" to focus sunlight as weapons of war to ignite fires and burn sails of enemy war ships

### 1 - 500 A.D.

- **20 A.D.** - Chinese document use of burning mirrors to light torches for religious purposes
- **100 A.D.** - Italian historian Pliny the Younger builds passive solar home using glass for the first time to keep heat in and cold out
- Roman baths built with large windows facing south to let sunlight for heat

### 600s

- Justinian Code enacted to protect sunrooms on houses and public buildings so that shadows will not interfere with the sun used for heat and light

### 1300s

- Ancestors of Pueblo people called Anasazi, in North America live in south-facing cliff dwellings that capture the winter sun

### 1600s

- Educated people accept the idea that the sun and stars are the same
- **1643-1715** - Reign of French King Louis XIV, ("Sun King"), is an era of solar experiments
- **1695** - French Georges Buffon concentrates sunlight using mirrors to ignite wood and melt lead

### 1700s

- European aristocracy use walls to store solar heat for ripening fruit (fruit walls)
- England and Holland lead development of greenhouses with sloping glass walls facing south
- Frenchman Antoine Lavoisier builds solar furnace to melt platinum
- **1767** - Swiss scientist Horace de Saussure invents first solar collector (solar hot box)

### 1800s

- Wealthy Europeans build and use solar-heated greenhouses and conservatories

- French scientist uses heat from solar collector to make steam to power a steam engine
- **1830s** - Astronomer Sir John Herschel uses solar cooker to cook food for his expedition to South Africa
- **1839** - French scientist Edmund Becquerel observes photovoltaic effect
- **1860s** - Post Civil War U.S. development of solar energy; pioneers find that water left in black pans in the sunlight gets hot
- **1861** - French scientist Augustin Mouchot patents solar engine
- **1870s** - Augustin Mouchot uses solar cookers, solar water pumps for irrigation, and solar stills for wine and water distillation (most widespread use of solar energy)
- **1880s** - Engineer John Ericsson, "first American Solar Scientist," develops solar-driven engines for ships;
- Solar-powered printing press working in France
- **1891** - Baltimore inventor Clarence Kemp, ("real father of solar energy in the U.S."), patents first commercial Climax Solar Water Heater
- **1892** - Inventor Aubrey Eneas founds Solar Motor Company of Boston to build solar-powered motors to replace steam engines powered by coal or wood
- **1897** - Kemp's water heaters used in 30% of homes in Pasadena, CA

## 1900s

- **1905** - Albert Einstein publishes a paper explaining the photoelectric effect on a quantum basis
- **1908** - Los Angeles: Carnegie Steel Company invents modern type of roof solar collector
- **1920s** - Solar Industry focus moves from California to Florida
- **1936** - American astrophysicist Charles Greeley Abbott invents solar boiler
- **1940s** - Great demand for solar homes, both active and passive, creates Your Solar House, a book of house plans by 49 great solar architects
- **1941** - Approximately 60,000 solar water heaters in use in Florida
- **1950s** - Architect Frank Bridgers designs world's first solar-heated office building
- Low-cost natural gas becomes primary heating fuel
- **1954** - Photovoltaics reach 10% efficiency; becomes the 'birth' of photovoltaics
- **Late 1950s** - Extensive use of solar cells in space industry for satellites
- **1960s** - Some U.S. solar companies manufacturing solar cells or solar hot water heaters; U.S. oil imports surpass 50 percent
- **1967** - Soyuz 1 is the first manned spacecraft to be powered by photovoltaics
- **1968** - First solar powered wristwatch is sold
- **1970s** - Department of Energy established; national solar research labs established
- **1973** - Energy shortages/oil embargo; indifference about solar energy begins to decline
- **1974** - Florida Solar Energy Center (FSEC), largest state solar center, is established
- **1974** - The world's first (modern day) building (in New Mexico), heated and powered only by solar and wind power

- **1977** - President Jimmy Carter installs solar panels on the White House and promotes incentives for solar energy systems
- **1978** - First solar powered calculators
- **1979** - Second U.S. oil embargo; Solar trade association (Solar Energy Industries Association) established in Washington, DC
- **1980** - Energy Security Act virtually shuts down national solar research programs; States begin establishing solar research facilities
- **1980** - Thin film photovoltaic cells exceed 10% efficiency and become a usable form of photovoltaics
- **1980s** - U.S. government and private industry assist several thousand Navaho and Hopi Indians in Arizona and New Mexico supplement their passive solar homes with photovoltaic power
- **1983** - Wisconsin enacts solar access law to protect the "right to light" for urban gardens, soon enacted in Arizona and Michigan
- **1986** - President Reagan removes the solar panels from the White House
- **1989** - Reflective solar concentrators are first used with solar cells
- **1990s** - Tokyo has approximately 1.5 million buildings with solar water heaters (more than in the entire U.S.); Israel uses solar water heating for approximately 30 percent of their buildings and all new homes are required to install solar water heating systems; Greece, Australia and several additional countries are ahead of the U.S. in solar energy usage

## **2000s**

- **2000** - Astronauts begin installing solar panels at the International Space Station. Each wing of the array consists of 32,800 solar cells
- **2001** - NASA's solar-powered airplane, Helios, sets a world altitude record for non-rocket powered craft at 96,863 feet
- **2003** - 9kW photovoltaic system and a solar thermal system were installed to heat the swimming pool at the White House
- **2008** - Photovoltaic cells exceed 40% efficiency in the laboratory
- **2013** - President Obama installs photovoltaic panels and solar thermal collector on White House roof
- **2014** - Ivanpah, a 392 megawatt concentrated solar powered generation plant goes online in California