



Is Solar an Effective Energy Source?

Environmental Study of the Sun - Technology

Essential Question	<i>Is solar energy an effective energy source?</i>
Outcomes	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● investigate solar panel design and operation or how solar energy is gathered by solar panels. ● complete a graphic organizer that collects main idea, summary (written/visual), evidence, and conclusion. ● identify the steps in the process of collecting solar energy. ● research the uses of solar energy and complete a jigsaw activity ● match solar vocabulary words to their definitions
Standards Benchmarks identified in RED are priority benchmarks.	<p>Science Assessment Targets</p> <p>P.a.4 Sources of energy (e.g. sun, fossil fuels, nuclear) and the relationship between different sources (e.g. levels of pollution, amount of energy produced).</p> <p>ELA Content Standards</p> <p>R.2.4. Determine the main idea of a text; recount the key details and explain how they support the main idea. (RI.3.2)</p> <p>R.3.5. Determine the main idea of a text and explain how it is supported by key details; summarize the text. (RI.4.2)</p> <p>R.4.2. Determine a theme or central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments. (RI/RL.6.2)</p> <p>R.5.2. Determine a theme or central idea of a text and analyze in detail its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text. (RI/RL.9-10.2)</p> <p>R.2.6. Determine the meaning of general academic and domain specific words and phrases in a text relevant to a topic or subject area. (RI.3.4)</p> <p>R.3.8. Determine the meaning of general academic and domain specific words and phrases in a text relevant to a topic or subject area. (RI.5.4)</p>

	<p>R.4.5. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone. (RI/RL.6.4)</p> <p>R.2.14. Compare and contrast the most important points and key details presented in two texts on the same topic. (RI.3.9)</p> <p>R.3.17. Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (RI.5.9)</p> <p>R.4.13. Analyze a case in which two or more texts provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation. (RI.8.9)</p> <p>W.2.7. Conduct short research projects that build knowledge about a topic. (W.3.7)</p> <p>W.3.6. Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (W.5.7)</p> <p>S.2.4. Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (SL.3.4)</p> <p>S.3.5. Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace. (SL.5.4)</p>
STEM Focus	<input type="checkbox"/> Science <input checked="" type="checkbox"/> Technology <input type="checkbox"/> Engineering <input type="checkbox"/> Mathematics

Teaching Skills That Matter (TSTM)	<input checked="" type="checkbox"/> Adaptability & Willingness to Learn <input checked="" type="checkbox"/> Communication <input checked="" type="checkbox"/> Critical Thinking <input checked="" type="checkbox"/> Interpersonal Skills <input checked="" type="checkbox"/> Navigating Systems	<input checked="" type="checkbox"/> Problem-Solving <input checked="" type="checkbox"/> Processing & Analyzing Information <input checked="" type="checkbox"/> Respecting Differences & Diversity <input checked="" type="checkbox"/> Self-awareness
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TEACHERS: this content was designed for ABE/ASE students. Instructional scaffolding and differentiation would be needed in order to use with English learners.

This HyperDoc can be adjusted to accommodate the different ways students learn by using scaffolding strategies and appropriate leveled materials. Instructional activities can be varied based on the skills that your student needs.

For more information about collaborating and sharing on Google Drive, check out videos 36-45: [Google Junior Training series - YouTube](#).

STUDENTS: Before you begin this lesson



- Go to File > Make a copy
- Change the name to: <your name> Solar Technology
- Begin working in your document

Be sure to read carefully. The green text is a prompt for reflection or activity.



Engage

What is Solar Energy?

Click on the link below to read:

[Renewable Solar Energy & Power](#)

Click on the link below to watch:

[Renewable Energy 101: How Does Solar Energy Work?](#) (1:54 min)

Complete the vocabulary terms as you learn more about solar energy. Write out the definitions as you find them in the information you are learning. Be sure to make a copy of the document before filling in your answers.

[Technology HyperDoc Vocabulary](#)

Later in the lesson you will be matching terms and definitions.



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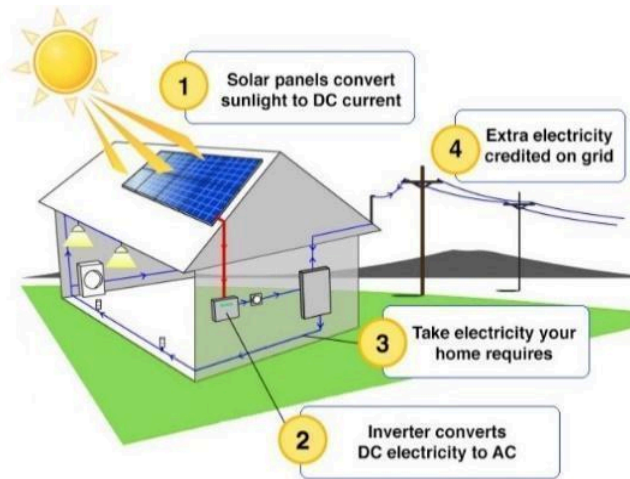
*As of 2020, the United States has a total installed solar capacity of 97.7 gigawatts (GW). That's enough to power nearly 17.7 million homes!**

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Explore

How Do Solar Panels Work?



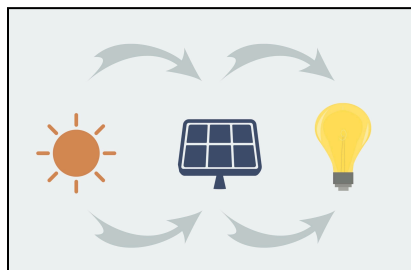
Source: How Solar Power Works <https://philsolar.ph/how-solar-power-works/>

Basic solar panel process:

1. Photons hit the solar cells of a solar panel, knocking electrons loose from their atoms.
2. Those electrons of DC electricity flow through the circuit and into an inverter.
3. The DC electricity is converted to AC electricity.
4. This electricity is added to the energy grid to power homes and businesses.

Source: Solar Panels

<https://www.greenmountainenergy.com/why-renewable-energy/renewable-energy-101/solar-panels>



Learn more about how solar panels work!

Take notes of the steps involved in gathering solar energy in the following resources. Compare the steps.

Read: [How Do Solar Panels Work Anyway?](#)

Watch: [How do solar panels work? - Richard Komp](#) (4:58 min)

Read: [Solar](#)

Did you notice some resources have 5 steps and some have 4 steps or as little as 2 steps?

Why are the steps different? How are they similar? Use the box below to write your answers:

After researching the solar power process, complete the [How a Solar Panel Works Activity](#).

When you are finished, check your answers against the [ANSWER KEY](#).



Explain

Watch: [Solar Photovoltaics 101](#)
(1:50 min)

Read:
[PV Cells 101: A Primer on the Solar Photovoltaic Cell | Department of Energy](#)



After reading the article and viewing the video, complete the [Solar Photovoltaics Graphic Organizer](#) that collects the main idea, evidence, and summary.

NOTE: You will need to download the graphic organizer and print a paper copy to complete. Share with your teacher what you have learned.



Elaborate

Homeowners and farmers have a lot of questions about using solar power in their homes and farms.

[Homeowner's Guide to Going Solar | Department of Energy](#)

Find what interests you!

Choose one of the perspectives in the right hand column and read several of the question categories in the guides.

For example, if I wanted to find out more about farming, I might choose: Will solar modules heat up and dry out vegetation or crops under the modules? Next, I'll read that section and write a summary to answer the question.

Pick a question that interests you and write a summary of your answer based on what you learned.

Next, go to [Flip Solar Technology](#) and record the question and your answer so that your peers can learn from your study.



[Farmer's Guide to Going Solar | Department of Energy](#)



Collaborate

Explain the Uses of Solar Power

In your collaboration, you will use a jigsaw learning strategy. This cooperative activity will enable each student in a group to specialize in a specific aspect of solar power usage. **Students will meet with members from other groups who were assigned the same material. After discussing and mastering the assigned content, "experts" will return to their "home" groups and share what they have learned.**

Your teacher will assign each student to a "home group" of 3-4 students. For this Jigsaw Activity, you will be assigned one of these articles:

[Solar Does What?](#)

[7 Amazing Uses for Solar Power](#)

[10 Surprising Solar Energy Facts](#)

[Top 10 Residential Uses for Solar Power](#)



[7 Uses of Solar Energy](#)

[What is Solar Energy Used For?](#)


“Expert groups” will gather information in their particular area using the [Uses of Solar Energy Outline](#). Here’s an example of how you might get started:

Uses of Solar Energy Jigsaw Outline	
Article Title: 7 amazing uses of solar power	Student Name: Judy
<p>A. Solar Air Conditioning</p> <ul style="list-style-type: none"> a. Operated by solar power through solar PV, passive solar, and solar thermal energy. <ul style="list-style-type: none"> i. Solar PV used for small residential and commercial cooling systems; most common technology used for solar cooling. Unfortunately, it has not yet become cost-effective without subsidies. ii. Passive solar cooling can be incorporated into building design – easier to achieve in new buildings rather than retrofitting. b. Funding available through the US Energy Independence and Security Act (2007) for solar air conditioning research and development to determine how to mass produce at scale. <ul style="list-style-type: none"> i. One example is a system developed in Australia by CSIRO which would save an estimated 15 megatons of CO2 if it was installed in every Australian home. The system is a 3-in-1 technology that provides solar cooling, hot water, and heating. c. One major use would be inside zero-energy and low-carbon buildings. <p>B. Solar Balloon</p>	

Read your assigned article and take notes by creating an outline of the information you are learning. These will be your speaking notes when you present in your Home Groups. Your teacher will provide a time frame for you to work on your article. **Take your completed outline back to your “home group” and share what you’ve learned with everyone else.** Now you are all experts!

Evaluate		
	<p>Go to the Solar Technology Terms on Quizlet.</p> <p>Using your definitions from the Technology HyperDoc Vocabulary, practice the terms by completing the self-study activities of Flashcards, Learn and/or Match options.</p> <p>When you are ready, take the Test and report your score here: Technology Vocabulary Results: _____/10</p>	<p>Complete the From the Sun to the Grid matching game by matching the icons to their descriptions.</p> <p>You can also get to the matching game with the QR Code to the right.</p> <div style="text-align: center;">  </div>

	<p>Or print the test, answer the questions, and submit it to your teacher.</p>	<p>Brag about your time! I completed the <i>From the Sun to the Grid</i> matching game in _____ : _____ . _____ !!</p> <p>Source: <i>From the Sun to the Grid</i> https://www.gosolartexas.org/how-solar-energy-works#videonsolarenergybasics</p>
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	<h2 style="margin: 0;">Extend</h2>	
	<p>Dig deeper into solar technology:</p> <p><u>Systems Integration Department of Energy</u></p> <p><u>Solar Systems Integration Basics Department of Energy</u></p> <p><u>Solar Leaders</u></p>	<p>Learn more about equity & climate:</p> <p><u>Climate & Equity SEIA</u></p> <p><u>Inside Clean Energy: The Racial Inequity in Clean Energy and How to Fight It - Inside Climate News</u></p> <p><u>Energy Equity ACEEE</u></p>