

SOLAR UNITED NEIGHBORS

SUN PATCH FOR SCOUTS BSA



Thank you for your interest in earning the SUN Patch for Scouts BSA!

Questions? Please feel free to reach out to us at any time at getinvolved@solarunitedneighbors.org

What Merit Badges does the SUN Patch Fulfill?

- **Energy**

3. Show you understand energy efficiency by explaining to your counselor a common example of a situation where energy moves through a system to produce a useful result. Do the following:
 - (a) Identify the parts of the system that are affected by the energy movement.
 - (b) Name the system's primary source of energy.
 - (c) Identify the useful outcomes of the system.
 - (d) Identify the energy losses of the system.



7. Tell what is being done to make FIVE of the following energy systems produce more usable energy. In your explanation, describe the technology, cost, environmental impacts, and safety concerns.

- Biomass digesters or waste-to-energy plants
- Cogeneration plants
- Fossil fuel power plants
- Fuel cells
- Geothermal power plants
- Nuclear power plants
- **Solar power systems**
- Tidal energy, wave energy, or ocean thermal energy conversion devices
- Wind turbines

- **Sustainability (Eagle Requirement)**

Energy. Do A AND either B OR C.

- (a) Learn about the sustainability of different energy sources, including fossil fuels, solar, wind, nuclear, hydropower, and geothermal. Find out how the production and consumption of each of these energy sources affects the environment and what the term "carbon footprint" means. Discuss what you learn with your counselor, and explain how you think your family can reduce its carbon footprint.
- (b) Develop and implement a plan to reduce the consumption of one of your family's household utilities that consume energy, such as gas appliances, electricity, heating systems, or cooling systems. Examine your family's bills for that utility reflecting usage for three months (past or current). As a family, choose three ways to help reduce consumption and be a better steward of this resource. Implement those ideas for one month. Share what you learn with your counselor, and tell how your plan affected your family's usage.
- (c) Evaluate your family's fuel and transportation usage. Review your family's transportation-related bills (gasoline, diesel, electric, public transportation, etc.) reflecting usage for three months (past or current). As a family, choose three ways to help reduce consumption and be a better steward of this resource. Implement those ideas for one month. Share what you learn with your counselor, and tell how your plan affected your family's transportation habits.

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ABOUT SOLAR UNITED NEIGHBORS:

We are a non-profit organization dedicated to helping people go solar, connect with other solar supporters locally and nationally, and fight for solar -friendly policies that protect the rights and interests of solar owners and solar supporters.



WE HELP PEOPLE GO SOLAR IN TWO WAYS:

- **Solar co-ops:** Solar co-ops are groups of neighbors in a particular community or area who are interested in going solar around the same time. Solar United Neighbors educates local residents about how solar works, generates interest in and facilitates a bulk purchase process, and provides support to co-op participants through the process of going solar.
 - Learn more about our solar co-ops [here](#).
- **On Your Own:** Our Solar Help Desk is staffed by solar experts who help homeowners, farmers, and businesses navigate the process of going solar, connect to local installers, and review proposals to ensure that consumers get the best possible solar pricing and services available.
 - Learn more about how we can help [here](#).

PURPOSE OF THE SUN PATCH:

The purpose of the patch is to educate scouts about how solar power works and to explore how solar energy plays a role in their communities, their families, and their lives as scouts, so that can become leaders in going solar in the future.

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SUN Patch Requirements:

1. Before starting work on any other requirements, first write down what you know about solar power and what it means to you.
 - Explain what you believe may be the current role of solar power in your area.
 - Explain what you believe may be the connection between solar power and scouting.
2. By reading the resource information provided in this patch program, find out:
 - How photovoltaic (PV) solar power works
 - Where solar power exists in your community, state, and across the nation.
3. Find solar panels in five locations in your neighborhood.
 - What are the solar panels powering?
4. Look at your home energy bill and evaluate the viability of going solar.
5. After your research is complete, have a discussion with your troop (or family) about solar power.
 - Discuss the benefits of solar energy, your home electricity consumption, and whether going solar might be a good option for your family to consider.
6. Investigate the energy industry in your state and how much solar power exists in your state compared to other forms of energy.
7. Write a letter to one of your U.S. Congressmen expressing your views about the importance of solar power.
8. Harness the power of the sun by doing at least one of the following activities: (see 'how to' instructions provided in this patch program):
 - Create a solar balloon
 - Make solar nachos
 - Create a fire with a magnifying glass
9. Become a Solar Ambassador in your community by doing one of the following activities:
 - Sign up 10 people to learn more about solar. You can sign up folks for the Solar United Neighbors newsletter using [this online form](#), or download our paper sign-up sheet [here](#).
 - Find out if there is a solar co-op in your community and encourage your neighbors to join! Check out our listing of [active solar co-ops](#).
 - Organize a solar open house in your community:
 - Download our [Solar Open House Toolkit](#) and read through it.
 - Contact getinvolved@solarunitedneighbors.org to get started.



Check out more information on how solar works and going solar in our [Solar FAQs](#).

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Check out more resources on solar concepts and issues on our [Learn the Issues page](#).

DISCOVER

PART 1: What is solar energy?

- The sun is a large ball of burning gas in the center of our solar system. It's made of mostly hydrogen that burns hotter than you could ever imagine.
- The sun is the largest source of energy in our solar system.
- More energy from the sun hits the earth in one hour than the ENTIRE world uses in a year. That's a LOT of energy!
- The energy that the sun produces is called solar energy. Solar means "from the sun."

ACTIVITY: Use the map below to compare the level of solar resources available in the United States, Spain, and Germany. Which areas have the most solar resources? Which have the least? How does your home state stack up?

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A solar panel (also called a “module”) is made of solar PV cells:



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Solar panels are wired together to form a “solar array”:



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Solar arrays can go on your roof:



Or on the ground:

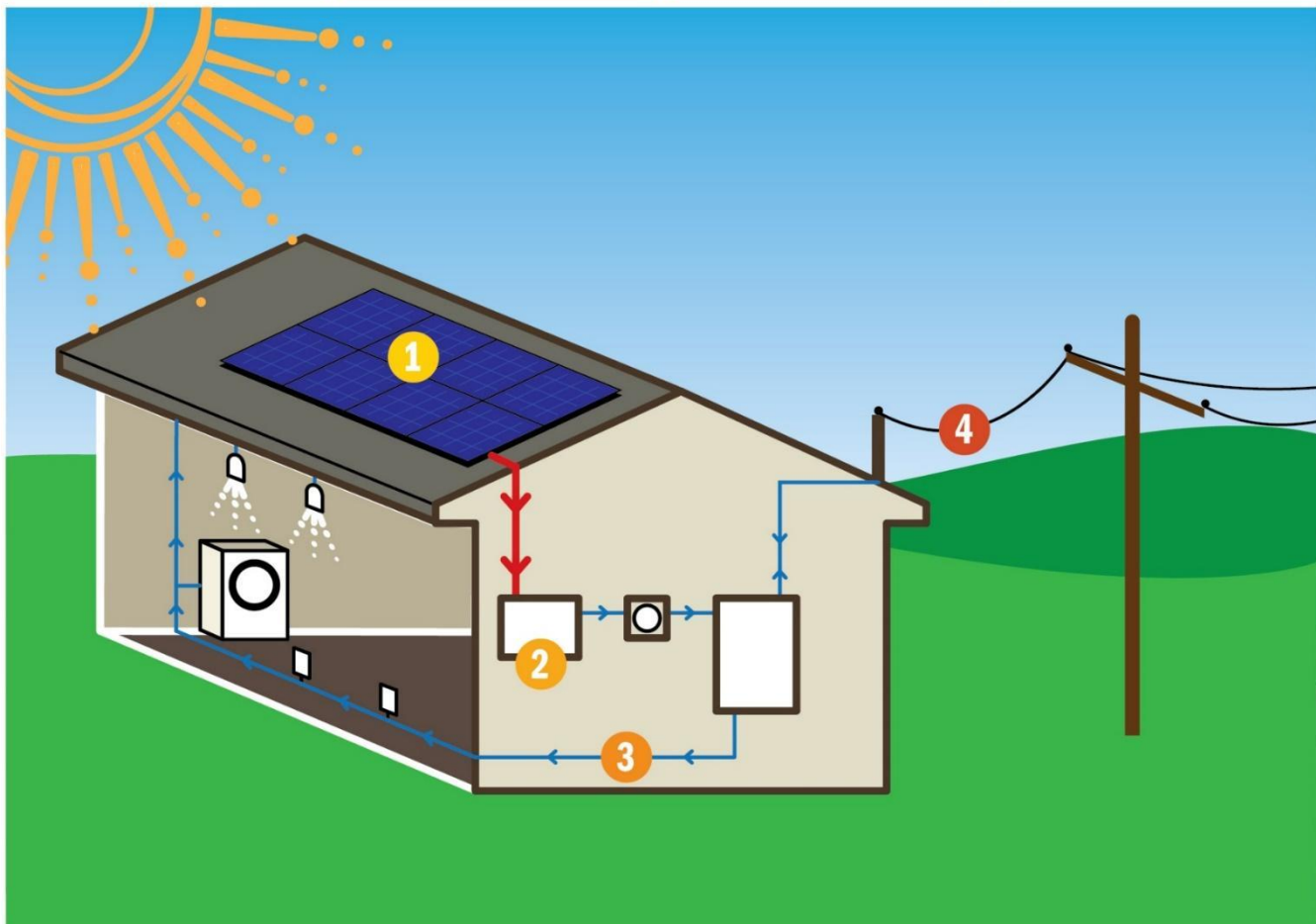


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- Electricity from your solar panels flows into your home to power your appliances and electronic devices.
- Excess electricity flows through your electric meter to help power your neighbors' homes, too.



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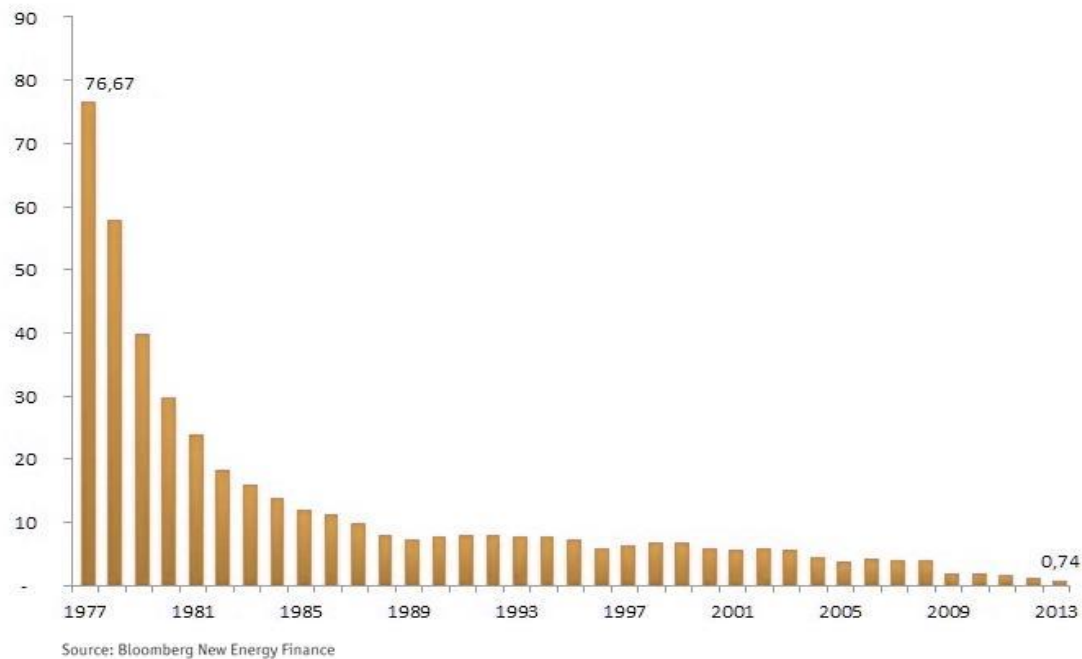


Solar's growing role in our electric system

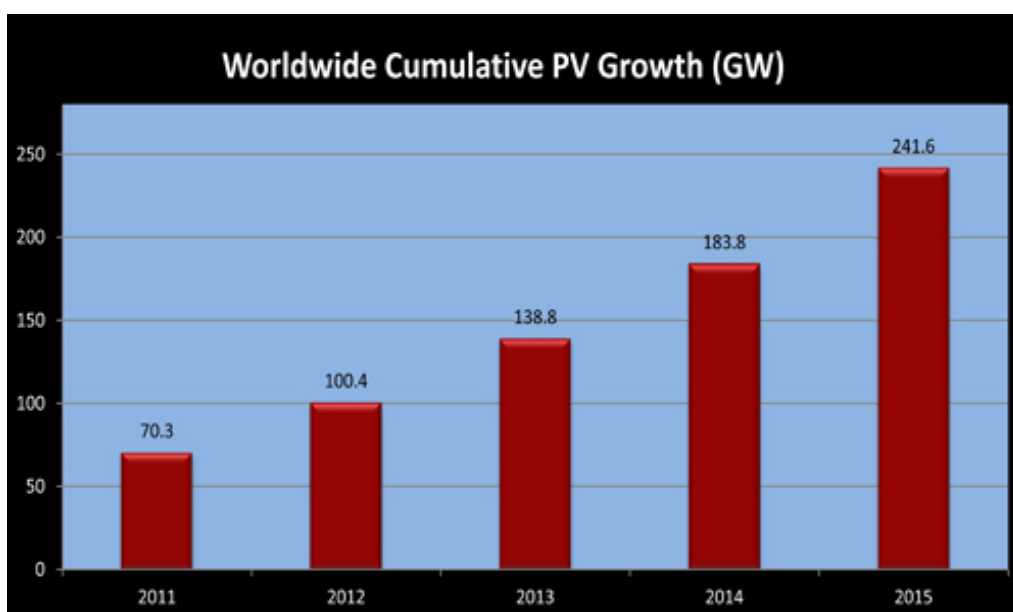
- Solar provides clean, renewable, locally produced energy. And solar panels are more affordable than ever! In fact, the cost of solar has dropped 90% since the 1970s.

The Swanson effect

Price of crystalline silicon photovoltaic cells, \$ per watt



- Around the nation and the world, more and more homes, businesses, schools, libraries, and governments are making their own electricity using solar panels.

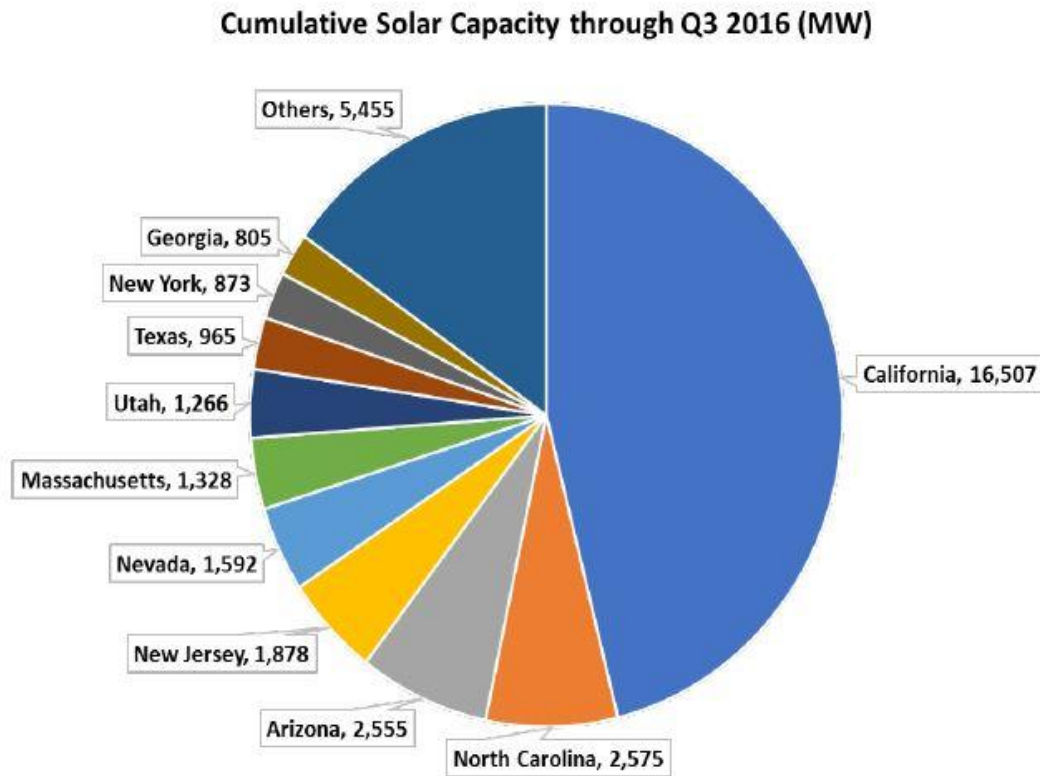


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- In the United States, California leads the way in solar installations:



ACTIVITY:

Is your home state listed on this chart?

Find out more about solar in your state using [the interactive map available here](#).

How many solar arrays have been installed in your state? How many solar jobs are in your state?

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Solar Power Scavenger Hunt

Solar power is present throughout your community powering traffic lights, signs and much more. These signs not only allow for everyday life to transpire but also save local governments money on power and electricity. Can you find any solar panels at work in your home town? Where?



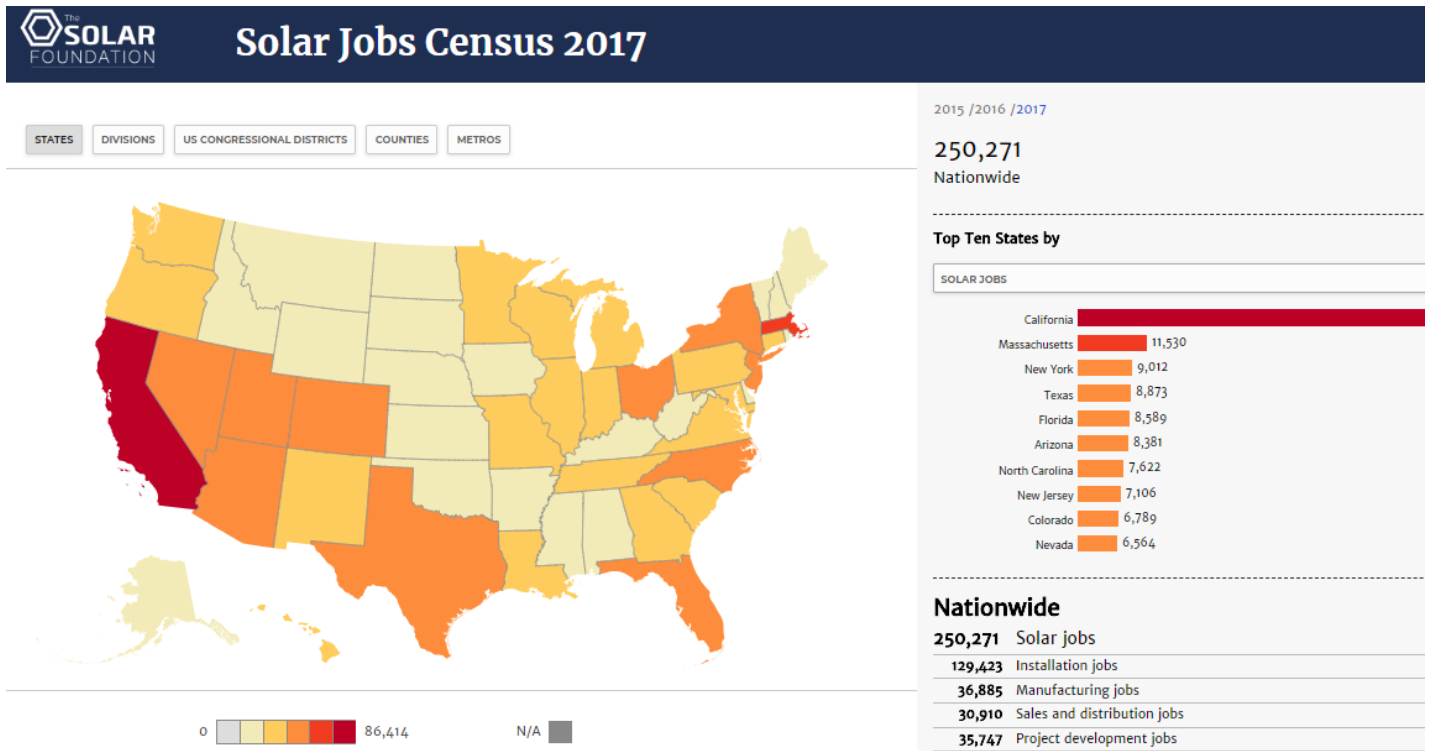
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Solar and the Economy

Solar creates jobs. As more solar is installed by homeowners and utilities alike, new jobs are being created across the country. The solar industry now employs more than 260,000 people nationwide and is adding jobs far faster than the overall economy.

- Take a deeper dive into local job creation using [The Solar Foundation's Solar Job Census](#). The map displays solar job figures on the state and county levels.
- How many solar jobs are in your state? How many are in your county? Do some online research to find out how many local solar installation companies are working in your area.



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Solar Power and Scouting

Scouting's core principles embrace solar power, sustainability, and fiscal responsibility. All scouts are encouraged to follow the outdoor ethic of "Leave No Trace". Much like picking up after oneself at a camp site so that others can enjoy the natural space in the future, solar power generates clean energy fueling our modern society, and leaves no trace of pollutants preserving the earth and its natural resources for the future.

The twelve points of the Scout Law also relate to solar power and sustainability. For example, the points Thrifty and Clean certainly apply. Solar power is a thrifty and clean use of the world's energy resources and of one's financial resources. Solar uses our abundant supply of sunlight to generate power without polluting the environment, as opposed to consuming our limited supplies of natural gas or oil with polluting consequences. Not only is solar power a clean, renewable energy source that preserves the world's finite resources, but also it is financially thrifty, saving people money on their energy bills and making them more energy independent.

However, these are not the only points of the Scout Law that may apply to going solar. A scout is Trustworthy when the scout can be depended on to act as a leader for the benefit of his community and his family in choosing solar energy, a reliable, safe and affordable energy source. A scout is Loyal to scouting beliefs by being a calm voice of reason advocating for solar reforms. A scout is Courteous promoting sustainability so that those in the future will have an opportunity to appreciate the world's natural beauty when it is their turn to share it and respecting the energy rights of everyone. A scout is Kind to treat the world around him with care, and to avoid using polluting energy sources. A scout is Brave when he stands up for his and other's energy rights. Maybe you can think of other ways to apply the Scout Law to solar power.

Solar power's many benefits certainly reflect scouting's core values and its guiding principles. As a future leader, it is important to learn about the ins and outs of solar power to take the lead in managing our future energy needs and fulfilling our goals for a sustainable and fiscally responsible tomorrow.

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How to Create a Solar Balloon (with adult supervision only)

Materials:

- 4 trash bags
- Large roll of duct tape (preferably black)
- Scissors
- Blow dryer
- A ball of string
- A clear sunny non-windy day

Steps:

1. Separate the four trash bags
2. Cut off the seal end (as close to the seal as possible), and find the long edge of the folded bag that is folded three times over
3. Insert the blade of a pair of scissors into one of the folds and cut all the way to the other end. You should be able to spread the bag open into a 3 feet (0.9 m) x 5 feet (1.5 m) sheet of plastic. Repeat this procedure for all 4 bags.
4. Join 2 bags together with masking tape, along the long (5ft) side of the sheets. You should have a 5x6ft sheet of plastic. Attach another bag to one of the 5 feet (1.5 m) sides, and then the last bag. You should have a long, 12x5ft sheet of plastic.
5. Join the two shorter (5ft) ends with the masking tape. You should now have a flat tube that measures 6 feet (1.8 m) x 5 feet (1.5 m).
6. Seal one of the open ends with masking tape. This is seam A. There should be a seam at the center of the new seam.
7. At the other end of this seam, take the remaining open end and pull it open.
8. Seal this opening, so the seam is perpendicular to seam A. There should be 3 corners of the balloon.
9. Cut about 5 inches (12.7 cm) off of one of the corners and invert the entire balloon like a sock.
10. Cut small hole at bottom and attach string to ensure you can does not blow away when released
11. Use blow dryer to inflate

What happened?

The black bag absorbed the heat from the sun, which in turn heated the air within the bag. The heated air within the bags then began to rise above the cooler air outside the balloon, which lifted the balloon in the air.

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How to Make Solar Nachos (with adult supervision only)

Materials

- 2 cups tortilla chips
- ½ - 1 cup of cheddar or mexican blend shredded cheese
- Pie pan
- Turkey cooking bag (or other large, clean plastic bag)
- Cardboard pizza box (the kind delivered pizza comes in)
- Aluminum foil
- Clear tape
- Plastic wrap
- Black construction paper
- Ruler, wooden spoon or stick

Instructions:

- To create your solar oven, cover the inner side of the top and bottom of the box with aluminum foil so that it will reflect rays from the sun. To do this, tightly wrap foil around it, then tape it to the back, or outer sides.
- Line the bottom of the box with black construction paper where the nachos will be placed—black absorbs heat.
- Place the tortilla chips into a pie pan. Sprinkle the cheese on top.
- Place the pan into a turkey cooking bag and twist shut.
- Place assembled nachos in the cardboard box oven.
- Use clear plastic wrap to create an airtight window for sunlight to enter the box. Open the box and tape a double layer of plastic wrap over the inside of the box. Leave about an inch of plastic overlap around the sides and tape each side down securely, sealing out air.
- The best hours to set up your solar oven are when the sun is high overhead - from 11 am to 3 pm. Take it outside to a sunny spot and adjust the flap until the most sunlight possible is reflecting off the aluminum foil and onto the plastic-covered window. Use a ruler, wooden spoon, or stick to prop the lid at the right angle.
- Reposition your solar oven when needed, so that it faces direct sunlight. You should check periodically on your oven to make sure it is in the sun. Make sure that the foil-covered flap is reflecting light into the box through the plastic-covered window.
- Wait until the cheese melts and the nachos are warm. Then peel back the plastic, enjoy your warm, tasty treat from the sun!

What Happened?

The heat from the sun was trapped inside your solar oven, and it got very hot in there. Ovens like this are called collector boxes, because they collect sunlight. As it sat out in the sun, your oven eventually heated up enough to melt the cheese! The foil reflects rays of sunlight and bounces them directly into the opening of the box. Once the sunlight has gone through the plastic wrap, it heats up the air that is trapped inside the oven. The black paper absorbs the heat at the bottom of the oven, and the plastic wrap keeps it from escaping out the sides of the oven. Your solar oven will reach about 200° F on a sunny day, so it will take longer to heat things than a conventional oven. Although this method will take longer, it is easy to use and safe to leave alone while the sun's energy cooks your food!

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How to Create a Solar Fire (with adult supervision only)

Materials:

- Tinder (newspaper, twigs, birds nest, etc.)
- Wood
- Magnifying glass
- 2 large buckets of water
- A safe stone or dirt area that receive direct sunlight (no vegetation should be present)
- Sunny day

Instructions:

1. Prepare area around where you plan on lighting the fire clearing it of all flammable objects such as leaves, twigs, and sticks.
2. Pour 2 large buckets of water and place near prepared area
3. Select dry tinder and place in prepared fire area
4. Gather wood and place near prepared area
5. Align Magnifying glass with sun and focus on tinder until the bright dot appears on your tinder make the circle that appears as tight as possible ($\frac{1}{4}$ inch is ideal)
6. Once focused, hold until tinder begins to smoke and burn then place wood around and on it to create a longer lasting fire.
7. Put out fire with water after you are done.
8. Make sure there are no remaining burning coals

What happened?

Sunlight not only illuminates the world around us but also contains energy in the form of heat. Through the use of a magnifying glass, the path of these lights are narrowed to a highly localized area (the dot of light that passes through the lens). This concentration of light results in a concentration of heat that can reach incredible temperatures. If a high enough temperature is reached the kindling will smolder and begin to burn.

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REPORTING

Congratulations! You've completed the SUN patch! Solar United Neighbors thanks you for learning about solar energy and helping to spread the word about solar in your community!

Instructions on how to get your SUN patches:

To receive your patch(es), please provide the information requested below and send by email to getinvolved@solarunitedneighbors.org:

- Troop number
- Troop location (town and state)
- Troop leader name
- Troop level/age range
- Number of scouts who participated in the program
- Number of patches requested
- Total number of hours spent on the program
- How did you hear about the SUN patch?
- What did the scouts learn from this program?
- Additional feedback about the SUN patch program?
- Mailing address that you would like us to mail your troop's patches to
- Optional: Photos of your troop earning the SUN patch!

Once we receive your patch request information, we will work on getting your desired number of patches mailed out to you. We are happy to provide you with the patches your troop has earned free of charge.

