

# Become a Climate Controller

BROUGHT TO YOU BY SOLV ENERGY AND SEI



## THE GOAL

After completing activities associated with learning about Sun Power, Girl Scouts will be able to:

- Define solar energy
- Understand how solar panels create energy
- Identify ways to conserve energy
- Become a Climate Controller

## BACKGROUND INFORMATION:

At SOLV Energy, we take on projects that have the opportunity to provide cleaner power, better jobs, greater education, and a brighter future for our communities. Backed by a powerful legacy, we're branching out to focus on renewable energy initiatives—continuing to build and manage more effective utility-scale solar, energy storage and high-voltage substation solar installations, and more. to learn more about SOLV Energy visit [www.solvenergy.com](http://www.solvenergy.com).

SEI is an environmental nonprofit that builds leaders to drive sustainability solutions. They engage, inspire, and empower K-12 students to become environmental leaders, green their campus and community, and develop green career awareness and skills through hands-on, experiential learning. To learn more about SEI visit [www.seiinc.org](http://www.seiinc.org).

**AGE LEVEL:** This patch is intended for Daisies – Ambassadors

## THE FACTS

Solar energy is good energy for all of us and the planet. Humans have used solar energy for thousands of years in many ways. The oldest uses of solar energy include heating, cooking, and drying. For example, families in ancient Greece built their homes facing the most sunlight in order to absorb more heat that would keep them warm during the cold winter nights. In 1948 a famous woman scientist, Maria Telkes aka The Sun Queen, created the first solar-powered oven!

One of the reasons we love solar energy is because it's one of the cleanest energy sources we have. It doesn't directly produce harmful greenhouse gasses that pollute local air quality and contribute to climate change. So, bring on the sunshine!



### WHAT IS SOLAR ENERGY?

We can use solar power in two different ways. As a heat source and as an energy source. Solar Energy comes from the sun and is considered a Renewable Energy source. What does that mean? Well Renewable Energy means that it does not need to be replenished on a human timescale, it replenishes itself. Sunlight is a free resource from the sun. We know that most days the sun comes up and brightens our day and we can collect the sun's rays and turn them into energy! We also have non-renewable Energy sources too. What is a non-renewable energy source? A non-renewable energy source means it cannot be replenished on a human timescale such as coal, gas, or oil. In other words, one day non-renewable energy sources will run out and once a non-renewable form of energy is gone, it is gone forever!

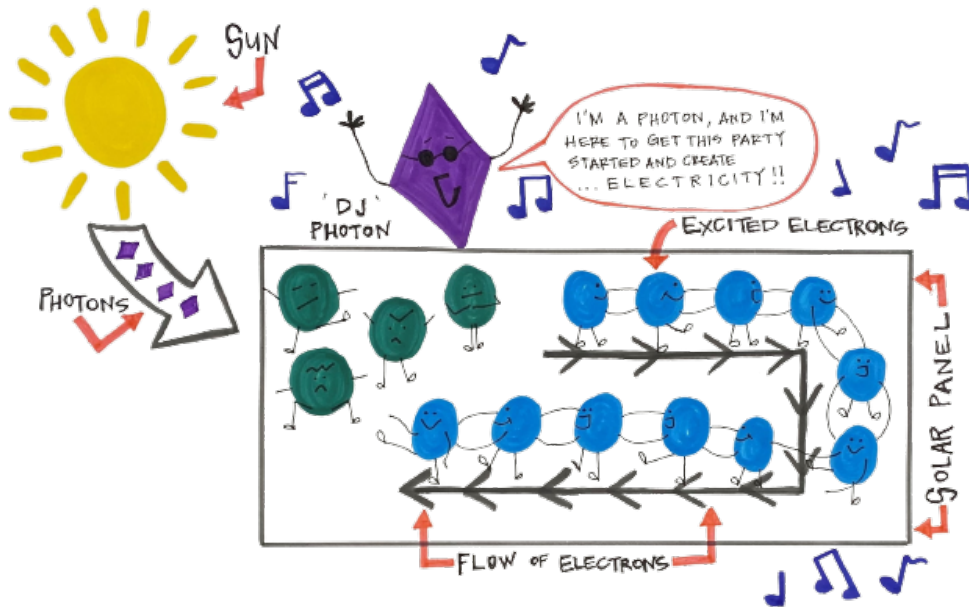
### HOW CAN WE COLLECT SOLAR ENERGY?

The sun's energy can be used in so many ways. It helps to warm the Earth, provides food for plants, and can also be collected in solar panels to create electricity!

**FUN FACT:** The word photovoltaic is two Latin words put together: photo, means light, and voltaic means electricity. Photovoltaic cells turn sunlight into electricity.

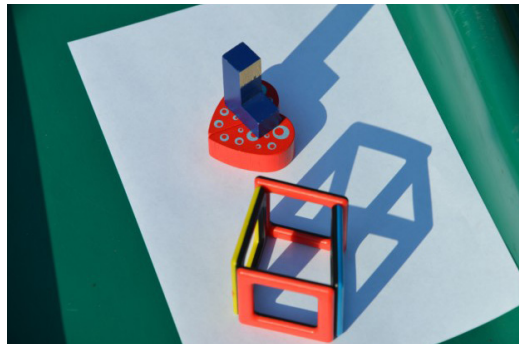
## BECOME A CLIMATE CONTROLLER!

One of the easiest ways to collect energy from the sun is through photovoltaic cells which live inside solar panels that creates electricity. The sun's sends down particles of energy called photons. Think of the sun as a DJ, the photons as disco lights and the solar panel as the dance floor! These photons come down from the sun with a mission, to start a power dance party! Inside the solar panel are electrons that are negatively charged particles in need of some fun. When the photons from the sun hit the solar panel, the electrons now want to move and groove. The electrons start moving when the sun is shining on them, and a conga line of electrons is started. This conga line or flow of electrons is electricity!!!



### LESSON IDEAS

#### 1. Sun Tracing



Solar panels need direct sunlight, and in order to capture the best sunlight, it can't have objects preventing the sun from reaching the panels. When the panels are shaded by an object, they can't create energy. Your paper serves as a solar panel, absorbing sunlight, which generates usable energy. The shading of objects prevents the sun from being absorbed into the paper. Thus, trees or buildings near a solar panel would shade them and the panel would not be able to create energy.

The shadows from the sun's reflection can create art from anything you choose. You can do this activity inside or outside too.

1. Inside: Set up materials near a sunny window or by a shade-less lamp. Outside: Set up on a flat surface.
2. Choose an object
3. Take a piece of white paper.
4. Capture your object in the shadow of the sun's reflection and create a drawing with markers, crayons, or pencils.

# BECOME A CLIMATE CONTROLLER!

## 2. Solar Oven

Here's a fun simple solar oven you can make that demonstrates the power of the sun, and how we can collect solar energy to use for our own benefit—in this case, heating!

Your solar oven works by converting sunlight into heat energy and then trapping the heat inside the box. When sunlight hits an object a few things can happen. The light can pass through the object, it can be absorbed by the object, or it can be reflected by the object. In this case we want to trap the sun's rays, turn it into heat, and cook your yummy s'mores! In your oven the light is reflected off the shiny surface of the aluminum foil and then passed through the plastic wrap. The light is absorbed by the black construction paper, which causes the paper and the air inside the box to heat up. This allows the oven to get hot and melt the marshmallows and chocolate! You could try other tasty treats like English muffin pizzas!

\*\*\* Always protect your hands when handling hot items \*\*\*

1. At the top of the closed pizza box, make a flap in the lid by cutting along the three sides and leaving the line at the back of the box. Make sure that your flap is 1-2 "smaller than the box itself.
2. Glue aluminum foil to cover the entire bottom of the flap. Now, open the pizza box and tape a double layer of plastic wrap under the lid — the sun is going to permeate it to cook the food.
3. Line the bottom of the box with black construction paper, and the sides with aluminum foil. Place your s'mores inside the plastic box and get ready for some tasty treats!



## 3. PowerDOWN!

We PowerUP! using Renewable Energy Sources but we also want to PowerDOWN! to help conserve energy too! Here's some tips on how you can PowerDOWN! and conserve energy! You can create your own checklist that works for your family and encourage everyone to come up with energy-saving items to add. As you start conserving energy, you'll find even more ways to conserve!

1. Turn off all the lights and electronics when you leave the room or leave the house. This includes the television, computer, and video games. And try doing homework next to a window with natural light instead of a lamp.
2. During the warmest part of the day, close curtains, or blinds to block the sun. You may want the curtains or blinds open for light while you're home, but there's no need to let energy escape while you're away.
3. Ask an adult to adjust the thermostat. Conserve energy by using less heating or air conditioning while your family is away from home.
4. Ask an adult to replace burnt-out bulbs with EnergyStar-rated bulbs. Energy-efficient bulbs use up to 80% less energy than incandescent light bulbs.

## BECOME A CLIMATE CONTROLLER!

### PowerDOWN! Pledge

I will learn about ways to conserve energy

I will conserve energy by turning off lights or electronics when not using them

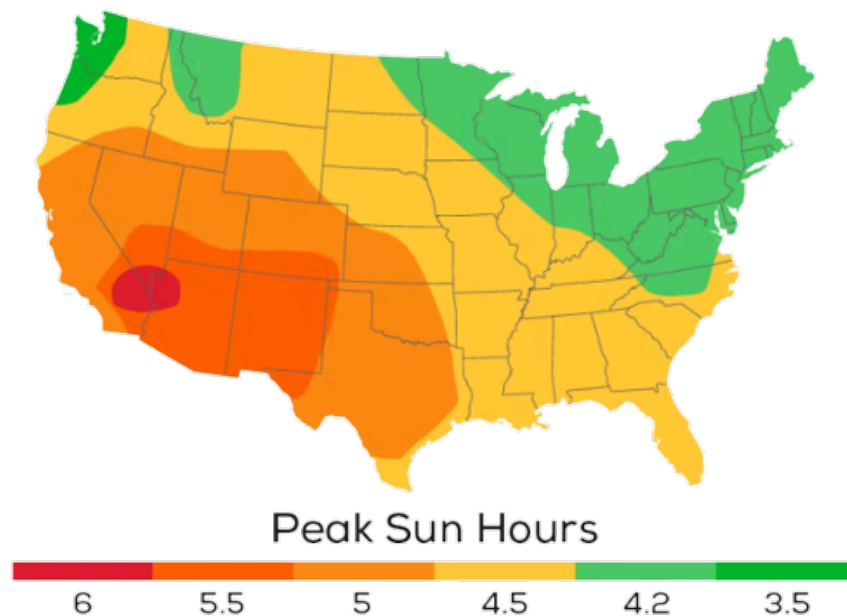
I will teach my family and friends about how to conserve energy

I will read a book or draw instead of using a tech device to PowerDOWN!



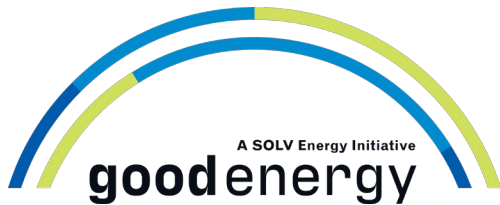
### SHINE BRIGHT!

Solar power requires the sun to shine in order to produce electricity. Solar power generation is calculated by a variety of measures. One way to measure is by using the peak sun hours within an area it will be installed in. The chart below indicates the amount of peak sun hours you have in your area.





# HOW DOES A UTILITY SCALE SOLAR SITE WORK?



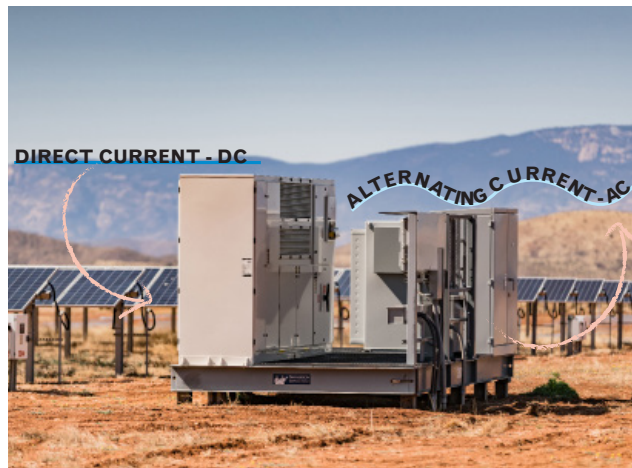
The sun's rays are absorbed by the photovoltaic cells of the panels. When the sun's rays interact with the silicon cell, electrons begin to move and this created a flow of electric current. The electricity created is **DC** or direct current.



The electric current that's created is captured through nodes and wiring in the panels. Individual panels are connected, like a daisy chain, by string wire to make up a row.



These rows of panels feed into a combiner box, which are set up at the end of the row. The amount of rows per combiner box is all dependent on the size of the individual rows. The job of the combiner box is to consolidate the **DC** power.



The combiner boxes feed the consolidated **DC** energy through underground cables to an inverter. The inverters convert the direct current (**DC**) to alternating current (**AC**), which allows us to use the energy from the sun! The number of inverters on a single solar site depends on the overall size and megawatts produced.



Between the generating station and consumer, electric power may flow through several substations at different voltage levels. A substation may include transformers to change voltage levels between high transmission voltages and lower distribution voltages, or at the interconnection of two different transmission voltages.