

PROJECT REPORTING FORM

STATE: MA.

SCHOOL NAME: CHILMARK SCHOOL

Goal: Investigating Our Community Solar Systems

ENERGY CONTENT ACTIVITIES:

- Project Summary
 - Collection, analysis and evaluation of community solar electric system data
 - Community solar hot water system
 - Constructing model solar cars for Energy Day all-island race
 - Giving community guided solar tours
 - Solar Experiments
 - Solar activity book
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STUDENT LEADERSHIP:

Katherine Smith, Lindsay Tocik

RESOURCES:

- NEED Elementary Solar Energy Kit, Schools Going Solar Activities, Forms of Energy, Exploring Magnets
 - Cape Light Compact Vineyard Education Coordinator
 - Vineyard Energy Project, model solar car kits
 - Energy web sites linked to NEED
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PROJECT SUMMARY

We are the Solar Sisters, Katy Smith and Lindsay Tocik. We have been studying solar energy all year long. We have turned into solar scientists. We studied solar energy in third grade, yet this year we have really learned more about solar technology and we investigated how solar systems work in our community. We also want everyone in our community to learn more about these solar systems!

We collected the data from the solar electric panels on our Community Center at least once every school week since January. We took the data and recorded it into a notebook, then transferred it to a spreadsheet on the computer. This was the first time we had ever used a spreadsheet and we had to learn how to use one. Then we analyzed the data from the spreadsheet. We have never analyzed data before this project. It was hard to do. We predicted that the sunny days would make more electricity than the cloudy days. It was correct!

We learned about solar hot water because our town uses it on the bathhouse in Menemsha and we wanted to know how it is different from solar electric panels on our Chilmark Community Center. Solar hot water is different than solar electric. Solar electric has photovoltaic cells. Solar hot water has a solar collector. Our bathhouse has five solar collectors on the roof that are heated by the sun. Everyone who goes to the beach can use the hot water the solar collectors make to wash their hands or take hot showers.

Making solar cars is a very good way to learn about solar electric energy. Making the cars taught us about solar panels, gears, motors, measuring, experiential learning, and about atoms. We made solar cars for Energy Day, so we can race them against other island schools. We also did this to learn more about solar electric energy. We made awesome cars!

We gave solar tours to visitors and year-rounders on the island. When we gave the tour we told them about the solar meters, the solar panels and the photovoltaic cells and how they work. Everybody we toured said that they learned a lot more about solar energy. From the tours we learned a lot we didn't know. We learn more with each tour!

Through this project we have learned so much. We learned about solar energy, how to make solar cars, the difference between solar hot water panels and the solar electric panels, how to make spreadsheets, analyze data, give a guided solar tour, more about photovoltaic cells, and atoms. We like to study solar energy because our future and our children's futures depend on it!

COLLECTION, ANALYSIS AND EVALUATION OF OUR COMMUNITY SOLAR ELECTRIC SYSTEM



The solar electric panels are very interesting in the way they work. First, the sun's rays come down onto the solar electric panel. Then the photovoltaic cells have a negative and positive charge that converts the sunlight into electricity when the electrons in the atoms move. The electricity then goes to the Sunny Boy, which converts the direct current in the electricity to an alternating current. It also records, but does not store, the electricity. It then goes to a meter, which measures the electricity. Finally, the Community Center uses the electricity! If there is excess electricity, it goes to our New England electric grid, where anybody can use it.

This is a good way to help our community. We let everyone know what is happening with the solar panels. We sent the information about the solar panel to our town hall and asked them to put in on their website. Since that is the only set of public solar electric panels in our town, people need to know about it. This project is very good community service.

Collection

We have been collecting the solar data from our local community center solar electric panels. It is pretty basic to learn how to do. To record the solar data we go to the Community Center and look at the Sunny Boy, which is the recording

system that is used here. We record the E-Total, E-Today, PAC, Date and Time in our red book. The E-Total is the total amount of electricity that has been made since the solar panels were installed. The E-Today is how much electricity was made that day depending on what time you record it. The PAC is how much electricity is being taken in that second. Then when we are done, we put the data all onto a computer spreadsheet so that we can analyze it and make any kind of chart we want.

Spread Sheet

How we used the spread sheet

Using a spread sheet is as easy as one, two, three. We learned how to make a spread sheet and we are going to tell you how to use it.



When we go to the main page, click on a subject/topic to type in the information for the topic. When I say topic, I mean information like the Date, E-total, E-daily, PAC, or time of day. Our first topic was date. Click on the first available box, scroll up and click on the long white box with the green check mark next to it. Then type in the date that is first in your solar data book and click enter. The date will show in the box you clicked on. It will automatically go down to the next box and go back up again to the space where you type in the date. If you make a

mistake, then simply click on the box where you made a mistake and type in your correct response. Then go back to where you left off.

Why we did the spread sheet

We did the spread sheet because it was easy for us to use, once we learned how. It is an interesting way to organize all of our data. Not to mention everyone in the town can now read the data from past months if they'd like without any trouble.

How our spread sheet helps our community

Doing the spread sheet helps us out and is part of our community. After we send in a copy of our spread sheet to the town hall, then our town can see how much energy they save or gain each day, and how big or small of a difference the sun makes in saving our town energy and money.

We learned a lot about how to use a spread sheet. We learned what it does, how it works and how to use it. Using the spread sheet is something we will need to know in life to organize information. We think everyone should know how to use a spread sheet. In our opinion it is the easiest way to follow your weather and solar data.

Analysis

We put our solar data into a digital spreadsheet. Then we compared the different conditions to the different amounts of electricity made on different days.

Does wind speed or wind direction change any solar electric out put?

Actually according to our calculations it doesn't make a difference, because we compared two sunny days and one had more wind and the same direction wind and they still averaged out to have made about the same amount of electricity.

What combinations of conditions produce the most amount of electricity?

According to our spread sheet the best combination of conditions is sunny with an out side temperature of between 40-50 degrees Fahrenheit with 1-10 mph winds blowing to the south. That is the best combination to make the most electricity.

What combination produces the least amount of electricity?

When we looked at our data we found that the conditions that make the least amount of electricity were snow on the ground and roof (especially the roof), but it could still be sunny and the temperature in the twenties with the wind at 1-5 mph blowing south.

We had much fun doing our analysis and spreadsheet. Basically we found that the sunny days made the most electricity and the snowy days made the least, especially because the snow was on top of the solar electric panels. That's something we had already predicted, before we collected all our data!

Evaluation

There are so many different things that we learned during this project. One of them is that when there is no sun out, the Community Center gets electricity from an electric grid that has many different power plants in it. Our electricity can come from any of those power plants. If the Community Center doesn't use all the electricity from the solar panels, the electricity goes back to the grid. We also learned how photovoltaic cells convert sunlight into electricity. On a cloudy day, the solar panels intake less sunlight than on a sunny day. Those are just three of the many things we learned during this project.

SOLAR HOT WATER

Solar hot water is different than solar electric. Solar electric has photovoltaic cells and makes electricity. Solar hot water doesn't make electricity. It has a solar collector.

We have five solar collectors on the roof of the Bathhouse in Menemsha in our town. The collector is a box that is all black inside, because the color black absorbs the sun. The collectors are heated by the sun and they make hot water for us to use in the summer, so we can take showers after we are at the beach.

Inside the collector there are pipes that get hot when the sun shines on it. There are also metal plates that absorb heat in the box. After the water is heated by the sun, the water goes through pipes to a heat exchanger. The heat exchanger transfers the heat from the water to a storage tank that's in the mechanical room. This storage tank is an electric hot water tank. Everyone who goes to the beach can use this hot water to wash their hands or take hot showers. If the water isn't hot enough, because it's raining or cold outside, the electric water heater heats it up from warm to hot. Then hot water comes out of the spout in the sink or shower and we can use it!

This project serves the whole island community because everyone uses the Menemsha state beach and the hot water.

MODEL SOLAR CAR CONSTRUCTION



Our fifth grade class made solar cars for Energy Day. Part of Energy Day is a model solar car race. We were the first fifth grade of the Chilmark School to do this project. We learned many things while having fun learning them. Our class made these solar cars to participate in the informing experiment known as “the race”. Also, we wanted to learn more about solar energy and share our excitement with our community.

This project is a good way to participate in our community. We race the cars with the rest of the kids on the island to learn and have fun together. It helps to teach others about solar energy while still being entertained by doing something most people know of and are very fond of. Many, many people from our community come to Energy Day and the race. It is our hope that being involved will help raise awareness in a way that spreads the use of solar energy not only throughout our community, but also the state, our country and possibly someday the world.

The solar cars were very fun to make. First, we got our solar car kit. In it was two pieces of balsa wood, which would be the chassis, a pallet of gears to help the motor work the wheels, axels, motor and the solar panel. This completed our kit. We then cut the wood in the perfect measurements. Then we added the axels and the wheels with the spacers so that they could turn. After that, we added the motor and the gears to the car. Next we positioned the solar panel so that it was at the best angle for the sun and so we could fit our passenger soda can on board. Decoration was all that was left to do. They look awesome! Finally, we did a test run and they worked really well.

When we made our solar cars we learned many different things. One of the things we learned was that the photovoltaic cells convert the sunlight into electricity and it gets used, not stored, right away. We learned that it’s best to have your solar electric panel on your car ninety degrees with the sun according to date, time and

season. Another thing we learned was to have your measurements right when you build your car. We learned that the hard way. If your wheels go crooked, or the gears don't work together, then the solar panel cannot race so well because the car is not efficient. Those are three things that we learned during our solar car experience.

Our class did this project to learn and then teach others about solar electric energy. We wanted to compete in our community solar race to show that learning and practicing solar use can be a fun and "green" way to live. We also did this because we wanted to learn more about solar electric energy to help our community as we grow up.

GIVING SOLAR TOURS TO OUR COMMUNITY

We gave tours to members of our community. The tours taught people a lot about solar energy. We learned that not that many people know a lot about solar energy so it felt good to be the teacher for once!



We also had to study in order to give the tour. We had to learn more about the photovoltaic cells and solar collectors. When we were teaching the people about the solar panels and photovoltaic cells, we had to explain to them what a Sunny-

Boy is and how it works, what a solar panel is and how it works, and last but not least, the solar meter.

When we were giving the tours, we were teaching people of different ages. Most of them were older than us and we were teaching them! As they say, “We all learn from one another.” So now I hope that giving the tours will persuade people to get solar panels to conserve energy. Let’s cross our fingers!

Giving the solar tours was very fun. I got to teach people my prior knowledge, and have the opportunity to learn more about solar hot water, solar panels and solar electric! We hope that we will get more chances to give solar tours! We have signed up with the Western Massachusetts Council of the Girl Scouts to give tours to girls scouts who live off-island. We also are signed up to work with the M.V. Solar Corps on our island.

SOLAR EXPERIMENTS

Photo Light Paper

Our class did an experiment using the NEED photo light paper. The special paper is paper that you put in the sun with something on it to make a pattern on the paper. Whatever is not exposed to sunlight stays the same color as the paper originally was. Then to add another affect and to seal the paper from double exposure you dip the whole piece of paper in water and then let it dry. They came out really well and looked amazing. We used a clover for St Patrick’s Day. Everybody really liked this experiment.

Radiometer



Our class did an experiment with a radiometer. The project was to observe the different ways that the radiometer worked. The radiometer has a light bulb outside glass with a small piece of metal pole about two and a half inches long inside the bulb. The pole has two arms coming out of it with a back-to-back piece of paper on each arm. One side of the paper is white and the other is black so the light bounces off the white piece and the light is absorbed by the black piece of paper and spins around. To determine how much sunlight there is, the faster the pole spins. This experiment was very fun and informing to do.

Solar Flashlight

The main idea of the flashlight is that the sun's energy recharges the flashlight during the day, and then you can use it for whatever you need to do at night. I think that everyone should use solar flashlights to save money on batteries and help our environment.

SOLAR ACTIVITY BOOK

We have put copies of our solar activity book at the Chilmark Library.