

Moving Toward Self-Sufficiency: Powering the Greenhouse with Solar Panels



Environmental Issue

After brainstorming what issues are affecting our school community, our group saw one major issue, energy consumption. As climate change becomes an increasingly dangerous problem in the world, our focus has been placed on renewable energy sources. Initiatives at the local level need to be implemented in order to expand this new energy source. These small initiatives can eventually lead to new ideas on a larger scale. We believe we can be the cornerstone for the start of this new initiative for our school community. After hearing various conversations from the media regarding renewable energy sources, we decided to go ahead with the initiative of renewable energy.

When our group decided on our broad topic, we narrowed our focus down to solar energy. Our aim is to shift the school's reliance on the grid over to renewable energy; we began with solar panels powering our greenhouse, currently powered by coal and gas. After implementing these solar panels, we will calculate our results and look to expand to more uses of renewable energy by solar panels. Our group, being the first to use solar panel technology at our school, is a huge step for progress in the future as an inspiration to our school and community.

Action Plan

Step By Step Procedure

1. Identify an area to conserve electrical energy
 - a. Use our hydroponic greenhouse
 - b. The hydroponic system uses grow lights, alongside air and water pumps, thus consumes a large amount of electricity
2. Collect data on watt usage in the greenhouse used by the water and air pumps and fluorescent lights.
 - a. Purchase a Kill-a-Watt meter to monitor electricity of hydroponic system
 - b. Record and run analysis on the data collected over a two week period
 - c. Use the data and calculate the quantity of solar energy needed
3. Educate the school community on the concept of solar energy
 - a. Advertise the cause to convey the importance of solar energy
 - b. Placing a short description of our team and our mission on the school digital announcement board
4. Research kits for solar panel installation that would be bought with the awarded grant.
 - a. Compare wholesale solar panel purchasing versus a professional installation
 - b. Establish a price range
 - c. Create contact with local professional solar panel installation company

Item	Watts (W)	Time (hrs)	Total Usage (kwh)
Fluorescent Lights	214	12	2.568
Air Pump Indoor	39.1	24	0.9384
Air Pump Outdoor	39.1	24	0.9384
Water Pump	28.3	24	0.6792
TOTAL:	320.5	84	5.124

Action Plan Continued

5. Presentation to the principal and director of plant services to get approval.
 - a. Calculation of cost to install our system
 - b. Access to plant services in case we run into a building concern
 - c. Ask about prior solar panel initiatives on campus
6. Work with plant services for placement and installation of solar panel
 - a. Establish where on the roof to place the solar panel
 - b. Discuss future projects utilizing solar energy on campus
7. Monitor Output
 - a. Attach the Kill-a-Watt meter and calculate the output of the solar panel system
 - b. Using the obtained data, research the impact of the seasons
8. Calculate energy conservation and environmental impact
 - a. Run the numbers through all the calculations finding tons of carbon emissions saved
 - b. Disseminate the numbers in regards to the environment to the school newspaper, the digital announcements, and the local news

Specific Responsibilities

Ray - System Design / Speak

Michael - Solar Researcher

Will - Creativity Director

Matt - Financial Manager

Mitch - Student Relation / Publicist

Action Plan Continued

Measuring success

The success of this project will be measured based on the awareness we create in our community. Not only at our school, but the extended community through the use of our school magazine, our website, and the local newspapers.

Quantifying Impact

We will quantify the impact by measuring the amount of energy the solar panels will produce and how much money/energy will be saved by the panels. This will save money that can be reinvested into the new plan of installing more solar panels.

Alongside financial savings, we will quantify to the best of our ability the feedback we receive from the community to ensure we continue to inspire others to take action such as the installation of solar on their residences. During a meeting with our administration, we learned they were already interested in the idea, but did not have enough money to start the project. We believe that our work will inspire others and could kickstart a larger project on campus.

How do we implement our ideas?

Our first goal was to educate the school community about solar energy in various ways

- A tri-fold poster was created to convey what the technology is and how it helps fight climate change
- A description of our group's initiative was submitted to our school's digital announcement system
- Our group's website <http://www.hydrocats.com/> provides additional information
- Held a meeting with our principal and director of plant services to gain permission to put up solar panels
 - Addressed the issues of installing a solar panel with the director of plant services, who offered his help and expertise
 - Presented the big picture of beginning the solar initiative at our school and continue to push forward with more ambitious solar projects

Implement Continued

Our second goal was to establish contacts with outside solar professionals alongside general sustainability groups in the area.

- Attended the two-day 2016 Cleveland Sustainability Summit
 - Worked on a project to construct a fully sustainable school that included solar panels
 - Met and exchanged business information with local solar company
- Joined the Youth Sustainability Leadership Program (YSLP)
 - Engaged our sustainable school initiatives with other local students
 - Plan to present our solar initiative at the 2016 EarthFest, hosted by the Earth Day Coalition
- Contacted and spoke with the Cleveland Mayor's Office of Sustainability

Implement Continued

Our third goal is the implementation of the solar panel system and looking into the expansion of our system to the entire school.

- Establish a place on the roof to place the solar panels
 - Outside of the greenhouse on the flat roof of our cafeteria on the west side of campus (see final slide)
 - Figure out the system specifications we want
 - How much energy our system uses
 - Wattage produced by panels
 - Amount of energy saved
 - Explore avenues for larger scale solar expansion at school
- 1) Daily wattage usage: = 5124 wh
 - 2) 5,124 Wh / 4 sun hours per day = 1,281 W
 - 3) 100 watt panels, we need roughly 12
 - 4) 1,281 W / 2 = 640.5 W (Roughly 6 panels which offsets half of our energy consumption)
 - 5) 640.5W * 4 hours = 2,562 Wh
 - 6) 2,562 Wh * 365 = 935.13 kwh
 - 7) 935.13 kwh energy saved annually

Results



Our efforts to educate the student body regarding the importance of solar energy is progressing and has been positive thus far. The school has been very open to our ideas, and has given us unwavering support. We were able to gain approval from our principal, and the plant services department has pledged their aid in the installation. A solar panel initiative was in the works on our campus a few years ago, however due to finances the project was ended. By picking up where this project left off, though on a much smaller scale, we have been able to ignite the solar energy movement here at Saint Ignatius High School.

Through this idea, a few of our members were able to attend the annual Cleveland Sustainability Summit and were given an enormous opportunity to connect with local sustainability groups in our area. As this was earlier on during our project, we engaged in a variety of different sustainability practices, but focused on solar with our creative groups. One of our members participated in an initiative of how to incorporate sustainability practices into local schools and a major component that was brought to light was solar panels. The collaboration effort was a great learning experience for our group and opened us up to the sustainability scene here in Cleveland. At the event, we were also able to establish relations with a local solar panel installation company that extended the offer to give us a free quote on the greenhouse solar panel system, if we decided to go ahead with it. In the end, we took this offer into consideration but decided upon a self installation with the help from our plant services department.

Results Continued

The problems we encountered during this project included getting momentum within the school community and staying within our financial budget for the solar panel system. The school has since received our initiative enthusiastically, the student body was difficult to reach originally until we made a push through our posters and PA announcements. With the combination of the two, the school was brought to light of the goals of our group and how they could help. This positive feedback culminated with the approval of our principal and the head of plant services. The second challenge has been the upfront cost of solar panels. With this in mind, our members sought to keep it close to our budget. Therefore, we continued to research cost effective solar panels and discovered the idea of self-installation with the help of plant services, helping us save financially.

One of our members was involved in the Cleveland Youth Sustainability Leadership Program. (YSLP). The solar panel initiative was explained to the participating students from other Cleveland schools alongside the director of the program, Stacy Albin, who works at the Mayor's Office of Sustainability. The initiative was well-received and was encouraged to be continued with the offer of the program's resources to further the initiative.

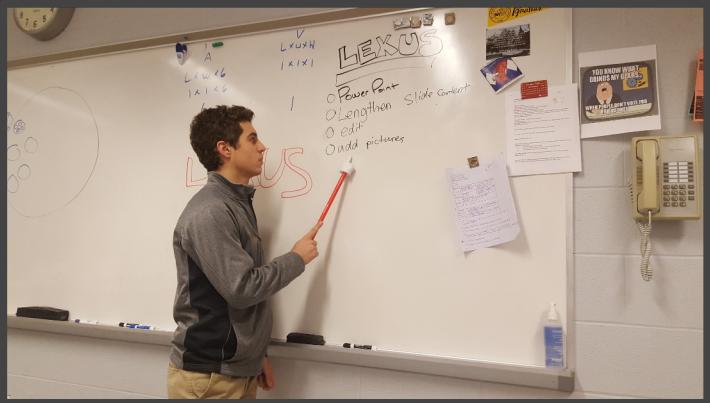
Results Continued

Though the actual implementation of the solar panels on the roof of our school has not happened due to the funds constraint and seasonal issues, the size and price of the system are in place. The system will consist of a total of 600 watts in solar panels, with a battery bank and the inverter incorporated into the grid itself, equating out to an estimated \$1,900. The amount of emissions saved from our system will be around 361 kg of CO₂ emissions, alongside \$105.12 in annual electricity bill savings. These numbers may seem insignificant, however they are not the main focus of what our group set out to do; the education of our school community and awareness that solar energy is feasible in Northeast Ohio far surpasses the economical advantages of implementing solar energy. The impact of inspiring a student or staff member to consider putting solar panels on their house is priceless and is the focus of our project. Thus, although we provide the above numbers for the quantifiable results, we value the impact of the initiative on our school community and hope to expand it further with the physical implementation of the solar panels.

Working through the project, the group was able to greatly expand our knowledge regarding solar energy itself, as none of us had previous experience in the field of solar energy. Although we faced a variety of challenges, we were always able to overcome them and enjoy the sense of achievement in the work we have accomplished so far. The group realized each other's true commitment to sustainability and formed a tight knit group that continued to meet outside of the hours devoted for Lexus Eco Challenge. We realized how eager our student body was once we were able to communicate with them in a clear way through posters and announcements. By having the commitment of the school on our side, the solar panel initiative grows every day and we believe we can accomplish anything to further improve our school ecologically.

What will you do with your winning?

- We will mainly put it towards our purchase of the solar panel system for the greenhouse
- Additional funds will be used to purchase more efficient hydroponic equipment, creating dramatic cuts in the consumption of energy (to cut down our carbon emissions)
- We will also put it towards our future research and experimentation in the field of solar energy
- We will implement it in other engaging forms of communication in the form of pamphlets and images to disseminate information regarding solar energy
- We will continue the work of our group and suggest to the school the possibility of the expansion of our solar panel system to power a larger portion of the school.



Outlining the project



Members Mitchell, Matt, and Michael work on researching solar panel systems



Ray in attendance at the Cleveland Sustainability Summit



Meeting with our school administration



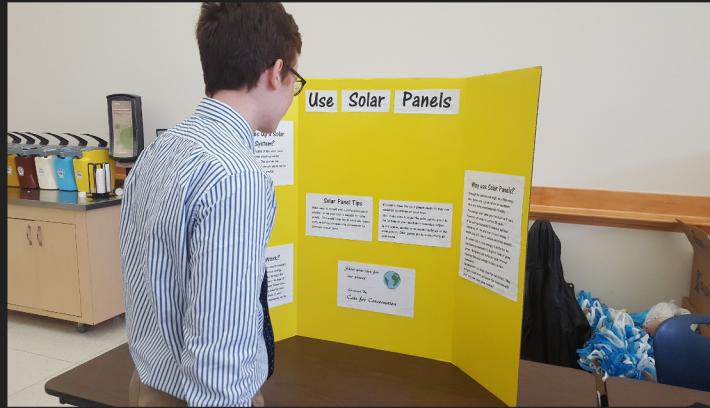
DWC Bucket system used to grow peppers and transitional plants



Lettuce NFT system



A DWC hybrid “Coffin” system used to grow tomatoes



Student interaction with our poster



Roof with potential location of solar panel

Greenhouse

Solar Panel

