G11 Solar and Battery Carports

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Project Description

G11 is the largest and minimally shaded area on Humboldt State's campus that could feasibly have a large solar and battery system. Appendix A is a diagram depicting the suggested area for the solar paneled carports. The total area available to be covered by solar panels is 54,801ft². The area was found using the Google Earth measuring tool. Utilizing the specifications from the average solar panel and how much solar radiation is received in this location the system has the capability to produce around 1,007,888kWh per year. The estimated energy was found using the NREL calculator. The total power this system would produce is 822kW. This estimation was achieved by taking the amount of watts generated per square foot of the average solar panel, 15W, and multiplying it by the total square feet. The excess power from this solar system has the potential to be stored into batteries that could therefore make HSU into an island of resistance against times of crises.

Types of Panels

There is a broad range of panels and design possibilities for this project. There are the traditional standard panels that have an efficiency of around 20-23%. Also, there are bifacial panels that could be looked into for this project. The cost for the typical monocrystalline panels for 54,801 sq.ft. is $4,000,000*. These panels capture solar radiation that is typically lost because sunlight is captured on only one side of a traditional panel. Bifacials have the capability to capture even more solar radiation by receiving the radiation that is received from the ground as well. Some companies like Lumos estimate that their panels have an efficiency of about 30%. Additionally, these panels would have lower construction costs due to their lightweight nature and less need for a stronger foundation. Although, the panels themselves do have a higher upfront cost compared to traditional panels. The cost for bifacial panels from Lumos for 54,801 sq.ft. is $6,750,000*. These are all factors that could be weighed out and determined if this proposal is selected to be further researched.

Batteries

Estimating the battery sizing required for this system to be used as a resource for islanding in a time of crisis would require much more time and information regarding the system design. After talking to an HSU engineering professor, Lonny Grafman, the best way to estimate this without having the former is to calculate the desired demand that would be by the university for a certain amount of time. From there the batteries can be properly sized. However, to get an idea for a large-scale battery system you can look at the microgrid at Blue Lake Rancheria. The Rancheria utilizes a 500kW/950kWhr battery for their 420kW solar system. The cost to install large scale batteries is about $1.20/wh*.

Project Alternatives

This project proposal mainly addresses what the design could be at its max potential. However, this project has unlimited flexibility and the design of the solar panels and batteries can be thoughtfully considered to fit whatever is best for the university and its students.

*These prices were acquired from Jeff Trigioff the President of Elements of Earth and Energy (EEE, Inc.), a California Licensed General Building, Electrical and Solar Contractor, since 2011. He is certified by the North American Board of Certified Energy Practitioners as a PV Installation Professional, Cert. No. 110112-152. Mr. Trirogoff has 20 years experience as a systems integrator

Need Statement

This school year we have faced power outages, COVID-19, massive fires, and large earthquakes loom on the horizon by living within the Cascadia Subduction Zone. A key factor linking all of these events together is that they have, currently, or will shake our community here at Humboldt State. The past six months in particular have served as a reminder that we are currently living in a time of crisis and we are ill-prepared to handle the needs of our students.

These times of hardship and crisis will continue, however, it does not mean shutting down and asking students to return to their hometowns has to be the new normal. We are at a pivotal point in time to develop and invest in Humboldt State's resilience against future crises. Currently, the only point in Humboldt to look to for safety is Blue Lake Rancheria. This is wholly unreasonable to place the whole weight of the responsibility to care for the county on the casino in an emergency. Furthermore, many students do not have the capability to travel off campus to reach a safer point. This stresses the importance that Humboldt State should be the place to look to in times of crisis when so many see it as their home.

HSU has an extensive climate action plan outlining the plan for decreasing emissions and adding renewable energy resources to this campus such as solar. HSU's goal of reducing greenhouse gas emissions to 1990 levels by 2020, to 80% below 1990 levels by 2040, and to become carbon neutral by 2050 can only be accomplished if direct action is taken. A project of this scale can be the catalyst to set HSU on the path towards carbon neutrality.

This project has large potential to incorporate student involvement. Students who participate in this project will be able to assess quantitative and qualitative data that can be used in projects or for classes. Currently, ESM 370; energy technology, and society, has a lab that estimates the power type and emissions stemming from HSU. Having a large scale project would allow classes with a focus in energy to see in real time renewable energy technology and how it helps to mitigate climate change. It is important to have a project as important as this publicized. Due to the large scale of the project it will be able to largely publicize itself. We have one of these largest environmental programs in the nation here at HSU. Any person, student or not, will see that we stand by the campuses and HEIF's goal to be sustainable. This project will set the bar for the local area and will be talked about in the same regard Blue Lake Rancheria is. Every student, future student, and community members will have excitement and pride knowing that HSU is living up to its sustainability goals.

In 2018 a similar proposal was submitted to HEIF. However, this proposal is different and so are the times. As mentioned before there will be no better time to take action and improve HSU's ability to resist crises. Additionally, one of the key reasons this project was denied was because of cost and disputes about the PPA. A PPA generally offers at 20% discount off of the current rate, while owning the solar array provides a 60% discount on the current rate. A PPA is useful when there isn't capital (money in the bank) to buy it outright. The reasons PPAs exist is because PV arrays are so exceptionally profitable. The student funds held by HEIF should be used to capture those same financial benefits, not given to a corporation of wealthy investors. HEIF funds are not "university funds," they are student funds and an $800,000 canopy solar array over the parking lot is cost-neutral to the university. If the University wants to create a PPA, then HEIF could be the PPA owner and the solar energy could be sold by HEIF to the University, as if it were a PPA.

Outcome

Our main goal through this project proposal is to help HSU reach its carbon emissions goal and to truly allocate student funds towards sustainability measures that will help make HSU a part of the climate action movement. We also hope to have large student engagement and be able to get a first hand experience on an energy project. This will be able to teach students a variety of skills such as; design components, economic impacts, energy savings, life cycle analysis and many more topics that are tied into a variety of majors curriculums. HSU is at the frontier of education and progress for the county and a project like this will raise the bar even higher. The project is expected to reduce CO2 eq by 1325tonnes a year. HSU's average total yearly carbon output is 7591 tonnes of CO2 eq a year making this about an 18% decrease in emissions a year. These panels will also be a platform for students to view energy and production and GHG savings through metering like the previous solar project done by HEIF. Overall this project will move HSU in the direction it has promised to do in its climate action plan. This is a key reason that this project be completed because it will show our campus community that we are resilient and can ensure the wellbeing of the students in the face of climate change and other rising challenges to our community. We hope that HEIF will understand the importance of progressing to a better future for its community.

Partners

Energy and Climate Club, Earthweek Every Week Committee, Redwood Energy, Cassidy Fosdick, Nicholas Brandi, Victoria Alvarez-Conn, Amanda Madden, Hannah Cantrell, Joshua Stamm, Reet Sehdev, Jacob Gomez, Gabrielle Smith, Economics professor; Will Fisher, Engineering professor; Lonny Grafman, CEOs of Redwood Energy; Michael Winkler and Sean Armstrong

Appendix A


Potential Solar Canopies
Legend
1
2
3
4
5
Google Earth
200 ft
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