

ENR2 Rooftop Agrovoltaic Array Grant Proposal - FY 2019

Project Description & Budget

Today, the University of Arizona (UA) sources just 0.5% of its electricity from on-campus solar, due in large part to two major barriers, those being the economics and the efficiency of solar on the UA campus. In 2012, the UA Solar Initiative locked the UA into a power purchase agreement (PPA), securing electricity from on-campus solar at a rate of approximately 11 cents/kWh. The combined rate that the campus pays between self-generated electricity and electricity provided by Tucson Electric Power works out to about 8.4 cents/kWh, much cheaper than the PPA rate, making self-generation of electricity via natural gas turbines cheaper on campus. In addition to this, conventional solar arrays tend to lose efficiency as they heat up, an effect compounded in extremely hot areas, such as Tucson, where, despite our abundant sunshine, the excessive heat results in a reduction of electricity production, limiting solar implementation.

With these facts in mind, this project aims to bring solar energy, research, and education to the roof of the Environmental & Natural Resources 2 Building (ENR2), with the installation of an “agrovoltaic” system. The term, “agrovoltaic” refers to the co-development of the same area for both photovoltaic energy- and agricultural-production. In simpler terms, it is the cultivation of partial-shade tolerant plants beneath an array of solar panels. This system creates a symbiotic relationship, where the solar panels provide shade from the harsh sun, enabling more efficient growth for the plants, which in turn cool the solar panels above via evapotranspiration (in some cases by more than 20°F), making them more efficient. Currently an emerging area of research, agrovoltaics could eventually improve sustainability on a large scale, as it is estimated to result in a 60% increase in land use efficiency through the simultaneous production of electricity and food. This agrovoltaic installation will provide a site for experiential education and community outreach as well as a place for research on a burgeoning sustainable technology. The overall purpose of this installation is to inspire conversations and ideas about imaginative, holistic sustainable technology.

This project has received support from Facilities Management (FM), Planning, Design & Construction (PDC), and the ENR2 building manager. Our team includes representatives from ASUA Students for Sustainability, the Community & School Garden Program out of the School of Geography & Development, and SolarCats, an ASUA club. The requested funding includes the transport, installation, and maintenance of the photovoltaic array and the agricultural system.

The proposed budget for this project is \$117,400 in FY 2019 and \$6,300 in FY 2020 and 2021. FM and PDC have stated that the associated project management costs of completing this project will be absorbed by their departments due to the large degree of student engagement. A detailed budget is included in the attached budget document. Our team recognizes the burden this particular project proposal would place on the limited funds of the Green Fund, and as such, we are working to identify additional funding within the Business Affairs division and will update the Green Fund board if additional funds are secured.

To account for any unforeseen issues in an infrastructure project such as this one, and to allow for timely completion, a contingency line-item has been included in the budget. Additionally, due to the recent enactment of a 30% tariff on solar panel imports by the U.S. government, and the uncertainty of how this will affect our project, another contingency has been included in the budget. Any unused amounts from both contingencies will be refunded to the Green Fund upon completion of the project.

Student Engagement

This project will not only increase the amount of renewable energy on campus, but will also engage thousands of UA students, Tucson Unified School District (TUSD) students, and local community members over its 20+ year life.

Thanks to the unique, open rooftop of ENR2, all students and community members will be able to take part in self-directed and guided tours, engaging with ample signage describing the project and its partners, enabling all visitors to learn more about the concepts of agrovoltaics and photovoltaics in general. The Community & School Garden Program alone aims to reach over 350 students and 50 educators each year, with parallel course work in Sustainable Built Environments and the School of Geography. For many visiting students, this facility will be their first exposure to not only agrovoltaics, but also to photovoltaics and renewable energy. For those with limited exposure to photovoltaics, these visits will serve as an important introduction to this critical, carbon-free technology. For those already well-versed in photovoltaics, these visits will serve to inspire students to reimagine what is possible in the realms of renewable energy and sustainability.

Beyond this, for university students, the installation of an agrovoltaic array will provide opportunities for leadership as well as experiential education. This project was initiated by students seeking to increase the amount and visibility of solar on the UA campus, and as a result have served and will continue to serve as a vital part of the planning, execution, and installation team, providing an unparalleled insight into solar procurement and project management. After the array is installed, university students will work to maintain and improve the agricultural side, engaging with novel research in how to better utilize unused spaces and create more efficient solar systems. Students will also collaborate on the creation of curricula for school field trips from TUSD, giving them the opportunity to learn effective techniques in sustainability education, while helping to educate the next generation.

Support of Green Fund Mission

Overall, this project will help to reduce carbon emissions, create a space for student led projects and research, new points of collaboration across sustainability-minded programs, and new experiential learning opportunities. These goals coincide with those of the Green Fund and the overall student body. On the energy side alone, this project will generate an average of 50,000 kWh of electricity per year, eliminating over 2.3 million pounds of carbon emissions, and generating a savings of \$101,388 in utility bills over 20 years. On the agro-side of the array, this project will also demonstrate how underutilized rooftops on the UA campus and across the Southwest can be transformed into productive spaces, lessening food insecurity and improving access to fresh foods, while also improving solar efficiency and adding new value to traditional solar systems.

As such, this project addresses many key deficiencies in the university's sustainability rankings according to AASHE, including Energy, Food & Dining, Campus and Public Engagement, and provides a unique Innovation, unseen anywhere else in the nation. The establishment of an agrovoltaics facility on campus will demonstrate the university's commitment to advancing sustainable technology and research.

With respect to the student survey, this project will reinforce UA's commitment to reducing climate change, foster relationships across student organizations, provide research opportunities, invest in student leadership and staffing to improve sustainability, and create out of class educational opportunities.

Metrics & Marketing

As part of the installation, the daily and cumulative energy production from the solar panels, along with the associated reduction in greenhouse gases, will be displayed on the T.V.s in Slot Canyon Café on the first floor of ENR2 and will also be readily available online for all UA faculty and students to use. The Community & School Gardens Program will track the number of students that engage with the project on all levels and will also actively report on research findings and food production.

UANews, Lo Que Pasa, the Daily Wildcat, and local Tucson news organizations will be contacted to advertise the project as it progresses, including student involvement in the planning and installation processes. Again, signage will engage and inform visitors. All social media, signage, video, advertising, and press will note that the project is supported by the UA Green Fund.