STUDENT SUSTAINABILITY COMMITTEE

Funding Application – Step I

Funding Criteria

A. General Rules

1. Students, faculty, and staff are encouraged to submit requests for funding. Student-led projects require a faculty or staff sponsor in order to have funds awarded.
2. Funding can only go to university-affiliated projects from students, faculty, staff, and departments.
3. All SSC projects must make a substantial impact on students. All SSC funding is 100% from student green fees, so the projects funded by the students must benefit them.

B. Things SSC Can Fund, On A Case-By-Case Basis

1. SSC can fund feasibility studies and design work; however, it must work toward ultimately addressing a sustainability need on campus.
2. SSC can fund staff positions that are related to improving campus sustainability. Strong preference will be given to proposals receiving matching funding from departments and/or plans for maintaining continuity of the position after the end of the initial grant.
3. SSC can fund outreach events with a central theme of sustainability, provided their primary audience is the general campus community.
4. SSC discourages requests for food and prizes but will consider proposals on a case by case basis.
5. SSC can fund repairs and improvements to existing building systems as long as it works toward the goal of improving campus sustainability.
6. SSC can provide departments with loans for projects with a distinct payback. Loans will require a separate memorandum of understanding between SSC and departmental leadership pledging to repay the award in full and detailing the payback plan.

C. Things SSC Will Not Fund:

1. SSC will not fund projects with a primary end goal of generating revenue for non-University entities.
2. SSC will not fund personal lodging, food, beverage, and other travel expenses.
3. SSC will not fund any travel expenses.
4. SSC will not fund tuition or other forms of personal financial assistance.

Instructions

Submit this completed application and one map, graphic, or picture to Sustainability-Committee@Illinois.edu. Please adhere to the session word counts. The committee holds the right to decline applications over the designated word counts. If you have any questions about the application process, please contact the Student Sustainability Committee Coordinator at sustainability-committee@illinois.edu.

Project Name: Feasibility Research on Food Waste Biodigesters using Extremophile Archaea for Ort Generated On-Campus
Total Amount Requested from SSC: $44,566.98
Primary Project Leader Name & Email: Henry Markarian (henrymm2@illinois.edu)

Project Abstract: In less than 100 words, briefly describe your project.

UIUC both generates tremendous amounts of food waste (as a byproduct of cooking for and feeding >20,000 students daily) and also consumes hydrogen to power certain buses. We are interested in circularizing an element of UIUC's economy by investigating how UIUC's organic waste can feasibly be converted to green hydrogen or natural gas. In order to do this, we'll work with dining halls and student housing to profile their waste footprints, and utilize our independently-developed waste processing techniques to see how much hydrogen our process (and natural gas from other common processes) can produce.

	Education	Energy	Food & Waste	Land & Water	Transportation
Project Category	No	Yes	Yes	Yes	No

Project Team Member List (student projects must include their faculty/staff advisor's information)

Name	RSO/Department	Email Address
Professor Yuanhui Zhang	Department of Agriculture and Biological Engineering	yzhang1@illinois.edu
Niranjan Kulkarni	Bioengineering B.S. Student	nkulka21@illinois.edu
Henry Markarian	Computer Engineering B.S. Student	henrymm2@illinois.edu
Juan Pablo La Fuente	Accounting and Finance B.S. Student	jpl5@illinois.edu

Questions	Yes	No
Is this a student-led project?	Yes	
If applicable, have you received approval from Facilities & Services and/or site manager?	Yes	

Do you have a plan for ongoing funding beyond SSC? (SSC cannot guarantee ongoing financial support)	Yes	
Beyond SSC, do you have sources contributing funding or support (ex. staff time, external grants, etc.) to this project?	Yes	
Have you applied for SSC funding previously?		No

Project Timeline

SSC funding agreements remain active for two years. Please list your project's timeline and/or milestones.

Our work begins over the summer in the lab, where we will use generalized food analogs to test the bioreactor's efficiency. By the beginning of the 2023/4 school year, we will have mass ratios for both digestate and hydrogen generated from various feedstocks. Then, we plan to investigate the food/organic waste footprint, hydrogen needs, waste management workflow, and space availability to determine viability and scale of our bioreactor system on campus.

Late May - August 2023: Determine bioreactor efficiency on various substrates that the university produces from the dining and residence halls (grains, fruits, vegetables, animal products, drinks, paper, cardboard, etc.). This step will yield mass-to-mass ratios for both waste minimization and hydrogen generation through our system, and tell us which feedstocks are most viable for use.

August - December 2023: Use our lab space to analyze samples of waste generated by UIUC from various locations to estimate bioreactor efficiency on real-world feedstocks, and prepare the final analyses and reports for public dissemination.

Project Description

In 250 words or less, describe your project. What does your project hope to accomplish? What are your project's deliverables? Bullet points welcome.

Our project is simply explained as a survey of the organic waste generation footprint of the University of Illinois at Urbana-Champaign, and then a set of tests on samples from the identified waste sources to determine their suitability for processing into green hydrogen or natural gas. Although our tests will use Integrated Dynamics' proprietary hydrogen generation methodology, the data we generate can easily be converted to quantities of natural gas or hydrogen generated from standard techniques.

Goals:

- Identify significant and suitable organic waste sources on the UIUC campus
- Quantify and qualify the waste generated at these sources in terms of substrate type, frequency, and other relevant variables
- Identify potential pilot bioreactor locations in the Urbana-Champaign or Campustown area which minimize total distance from aforementioned sources
- Sample waste from aforementioned sources and measure their hydrogen yield using our methodology

Deliverables:

- Quantitative and qualitative report on UIUC's organic waste generation, including sources, composition, and associated carbon footprint
- Public-access data on the products of our testing on selected waste samples, with analysis on each sample's viability as a bioreactor substrate source
- Extrapolation of the above data to the likely products of other publicly-available natural gas and hydrogen production methods
- A final report on the feasibility, costs, and benefits related to adopting bioreactors as an organic waste disposal method on campus

Environmental Impact

In 200 words or less, how does your project increase environmental stewardship at UIUC? If applicable, what is the carbon, water, waste, and/or energy savings? Does your project relate to the iCAP? Bullet points welcome.

It is commonplace knowledge that organic material generates immense environmental and ecological pollution when allowed to decompose in landfills. Directly, it releases methane and carbon dioxide into the air, toxic byproducts into the water and soil, and provides sub-optimal feedstock to the local flora and fauna. Indirectly, the transport of waste contributes to the university's carbon footprint.

Our project is the university's first step towards independent bioenergy generation infrastructure, which has the capability not only to offset the pollution our waste creates, but also the upstream pollution our power creates, as our model can feasibly generate ~700kWh of energy from a metric ton of carbohydrate-based waste.

In summation, by turning our waste into hydrogen power, we save the soil, air, and water from landfill pollution, and also contribute less to the pollution from non-renewable power sources.

Student Impact

In 200 words or less, how will this project benefit students? How will students be involved with this project? What educational components are in your project? Bullet points welcome.

In our project, students will have the opportunity to be directly involved in the research and development process of the bioreactor. We plan to collaborate with various departments and their students across the university, including engineering, environmental science, and business, to create an interdisciplinary team who will work together on this project. Additionally, we plan to offer research internships to students who are interested in gaining hands-on experience with the bioreactor and its operation. This will provide valuable educational opportunities for students to learn about renewable energy technology, waste management, and sustainable business practices.

The bioreactor will also provide an indirect benefit to students by contributing to campus sustainability efforts, which is covered above.
Finally, our project includes several educational components that will benefit students. We plan to document our research and development process in order to create educational resources for future students who are interested in pursuing similar projects on a student budget.

In summary, our project to develop a bioreactor that metabolizes food waste into hydrogen will provide numerous benefits to students, including opportunities for collaboration, hands-on experience, and education about renewable energy and waste reduction.